JUNE 17, 1937

Railway Age

DAILY EDITION

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Proving Ground

The Association of Railway Electrical Engineers meets today at the Hotel Chelsea. It will receive and discuss five progress reports respectively on illumination, car electrical equipment, locomotive electrical equipment, railway automotive equipment, and motors, control and wiring installation. It is within this body that work on electrical subjects is frequently initiated before the finished product is incorporated into the work of some of the A. A. R. mechanical committees dealing with things electrical.

The arrangement makes for an efficient method of procedure. To the A. R. E. E., electrical work is of paramount importance and essential details are not lost sight of, as they might be by the A. A. R. because they are of less importance than something else. As the A. R. E. E. work is developed it can be taken up by the A. A. R. and be handled efficiently without occupying the time of those interested in a wider scope of activities. The A. R. E. E. also performs another important function. It cooperates and holds joint meetings with the Electrical Section, thereby coordinating the electrical work of the Mechanical and Engineering departments. This serves to simplify railroad electrical standards and avoid duplication of committee work.

L. W. Wallace, director of equipment research, has given high praise to the A. R. E. E. for what it has done in the field of air conditioning and has had the acumen to use this association's ground work in developing his splendid reports on this subject. An Electrical Division has been proposed, but at least under present circumstances the fact that the A. R. E. E. is not directly a part of the A. A. R. is of essential importance to its value. An appreciation of its usefulness has saved many a mechanical department headache.

Problems Confronting Mechanical Officers

A host of questions regarding new developments in railway equipment and materials will doubtless be answered at this convention, and yet these are by no means the only vital problems, nor perhaps even the most important ones, which confront mechanical department officers. In response to a specific inquiry, 33 representative men from different roads, mostly in the west and middle west, expressed their views on this subject. One motive-power officer frankly said that his principal problem is labor, a feeling which is doubtless shared, if not so freely expressed, by most other responsible mechanical-department heads. Four other men referred to problems of personnel. One urged closer co-operation between maintenance forces and supervision; another said that shop men do not know enough about material costs; a third pointed out the scarcity of competent apprentices and trained mechanics; and a fourth expressed the opinion that one of the most important problems is "attracting new blood for mechanical-department supervision."

The next need most commonly mentioned was for modern shop machinery and equipment to replace that rendered obsolete by new developments, and particularly the special requirements for overhauling costly, high-speed motive power and car equipment and returning it to service with a minimum of delay. One mechanical officer said that the need for this new machinery is most urgent because of the relatively few new installations made since the last convention. Another said that modern machinery is especially necessary, combined with centralized production methods on

shop-order work. Evidently the deferred purchase and installation of modern railway machine tools and shop equipment in recent years constitutes a very real railway problem.

Another subject frequently mentioned as presenting difficulties to mechanical officers especially was air conditioning and here, again, all of the questions do not pertain to mechanics. One car-department head said that finding out what the public really wants in the way of air conditioning and what temperature range will best meet the desires of the non-existent average man, is a problem still unsolved. Another experienced car man suggested a study of the effect of air conditioning on car maintenance and cleaning costs at terminals. The real problem in connection with air conditioning, and one now receiving intensive study by all alert manufacturers interested in this field, is how to reduce the unit weight and cost of their particular specialties without sacrificing capacity of reliability. Weight reduction is especially desirable in equipment intended for application in some of the new trains which are being designed, so as to save every pound of excess weight which is enecomically justifiable.

Some interesting miscellaneous problems confronting mechanical officers may also be mentioned, such as "Savings by higher locomotive steam pressures"; "Savings possible with light-weight freight equipment"; "Maintenance of Diesel motive power"; "Steam versus Diesel power in long, fast passenger-train service"; "Prevention of boiler explosions due to low water"; "Counterbalancing for high-speed service"; and last, but not least, "Lubrication of locomotive cylinders with superheated-steam temperatures over 700 deg. F."

It Includes Them All

When the Railway Supply Manufacturers Association last showed its products at Atlantic City in 1930 there was one air-conditioned passenger car in service. That was the Baltimore & Ohio's diner "Martha Washington." Now there are about ten thousand, representing, with the required services, an addition to railroad plant worth $60,000,000, and still growing. In 1930 streamlining was applied only to aircraft. Now it is deemed an essential part of locomotive and car design in all applications conceived to impress the railroad customer with the value of new services and higher schedule speeds.

These two innovations are only examples of what has been going on during the past seven years but they have had a far reaching effect. They require new materials for car and locomotive construction, revolutionary ideas of design and decoration, braking equipment with extraordinary capability, greatly increased train power requirements, new yard and terminal services, a rehabilitation of shop facilities, etc. They have probably influenced the development of most of the new products shown, and the exhibit this year, by contrast with 1930, more than ever before indicates the trend of railroad progress.

A Study in Power

As the visitor to the locomotive track exhibits views the eight modern locomotives on display there he is forcefully impressed by the wide range of power and the diversity of character of the primary tools of today's railroading. From the 600-hp. Diesel-electric switcher, designed for the maximum in flexibility, availability and economy in yard operations, to the 7,000-hp. electric passenger locomotive, built to handle heavy main-line trains at speeds up to 90 m. p. h., the designing engineers have provided the operating departments with a type of equipment best suited to the needs of numerous specific conditions. These locomotive exhibits offer also visible evidence of the value of the challenge of competition.

Where steam once held the field alone the electric locomotive first contested its right to supremacy, offering the ability to handle a heavy volume of traffic economically and a transportation tool with which to eliminate smoke and congestion at large terminals. Electrification, the first challenge to steam, spurred the designers of the latter type of power on to greater efforts with the result that the past 15 years have witnessed the most rapid development in the history of the steam locomotive.

Next, with the rise of the automotive industry, the influence of the designers of that type of equipment began to make itself felt in the railroad field, the internal-combustion engine using gasoline as fuel being one of the initial contributions in the field of motive power. The limitations of mechanical transmissions turned the attention of builders to the possibilities of electrical transmission of power—a contribution of steam's first challenger—and developments in this field paved the way for the use of the higher-powered Diesel engines of today. Each step in this competitive battle has reacted to the advantage of America's railroads until today, when economy in operation is an absolute necessity, we are fortunate in having the tools with which to do the job.

Aside from the technical aspects of motive-power design the work of other types of transportation has had an important influence on the general appearance of motive power. Streamlining, at first of interest to railroad men because of the possible saving in power by reason of reduced air resistance, has been utilized, with the help of industrial designers, to produce a pleasing and attractive design, contributing in large measure to the revival of interest in railroad travel on the part of the general public. Streamlining, as a type of design, has had the help of the rapid development in

modern finishes until today's locomotive is really a work of art.

An early visitor to the track exhibit summed it all up in one sentence—"Here, in one spot, is a remarkable panorama of progress in locomotive development."

Foreign Visitors

The exhibit plays an important part in showing foreigners what America is like. Trained from infancy to regard Americans—and particularly American business men—as crass materialists, hungry and ruthless in their chase of the almighty dollar, the educational features of the show, and particularly the immense amount of research for the benefit of the industry that it portrays, are a revelation to them. If they are at all observant, they go away from the convention convinced that their preconceived notions of American materialism are wrong—or, at least, like Mark Twain's death, "greatly exaggerated." Actually, foreign companies are much more concerned with immediate expediency, with cashing in at once regardless of the future, than are American manufacturers. The latter, in most instances, take a far-sighted view and know that, by aiding the technical progress of the industry they serve, they are building a much sounder and more lasting edifice than any fly-by-night tactics could possibly produce.

The immense amount of research done in this country is a never-failing source of wonder to the foreign visitors to these shores, upsetting, as it does, all their preconceived ideas. Last fall, when a number of foreign railway mechanical engineers came to this country to attend the World Power Conference, they were impressed and interested by the streamline trains and by our shop methods, but the thing that left them speechless was the research in which American industry indulges. In correcting erroneous impressions of America and American business methods, the Atlantic City show not only is of benefit to the railway supply industry and to the American railways, but also to the nation as a whole, since the foreign engineer is much more impressed and more likely to remember actual, concrete evidences of engineering research and progress than any amount of abstract talk or literature on international relations and economics.

The Programs for Today

Three railroad associations will hold meetings in Atlantic City today. The Mechanical Division of the A.A.R. will meet in the Auditorium, the Air Brake Association at Haddon Hall, and the Association of Railway Electrical Engineers at the Hotel Chelsea.

Mechanical Division

The Mechanical Division will meet in Room B, at the right of the stage in the main exhibit hall of the Auditorium. The meeting will be called to order at 9:30 a.m., daylight saving time, and is scheduled to adjourn at 12:30 p.m. The program follows:

Individual Paper: "Research and Locomotive Development," by W. H. Winterrowd, Vice-President, Franklin Railway Supply Company, Inc.

Discussion of Report on: Locomotive Construction.

Air Brake Association

At a meeting of the Air Brake Association's executive committee last night final plans were made for the two-day business meeting which will be held at Haddon Hall, Thursday and Friday, June 17 and 18. The sessions will begin promptly at 10 a.m., daylight saving time. Committee reports will be presented on the following subjects:

New standard Type-AB freight car brake.

New H. S. C. passenger brake.

No. 8-ET equipment.

Terminal testing and inspection of the No. 8-ET equipment.

Inspection and maintenance of brake beam hangers and attachments.

F-1 lubricator for steam-driven air compressors.

Type-AB empty and load brake equipment.

Association of Railway Electrical Engineers

The semi-annual meeting of the Association of Railway Electrical Engineers will be called to order at the Hotel Chelsea at 9 a.m. daylight saving time. The program follows:

Opening remarks by the president.

Unfinished business.

New business.

Report of secretary-treasurer.

Progress report—Committee on Illumination.

Progress report—Committee on Motors and Control.

Progress report—Committee on Railway Automotive Equipment.

Progress report—Committee on Locomotive Electrical Equipment.

Progress report—Committee on Car Electrical Equipment.

General discussion on any questions in connection with progress reports of other committees.

Entertainment

10.30 A. M.—Organ Recital, Ball Room. William H. Jackson, Feature Pipe Organist.

2.00 P. M.—Organ Recital, Ball Room. William H. Jackson, Feature Pipe Organist. Ladies' Bridge Party.

9.00 P. M.—Grand Ball, Ball Room. Johnny Johnson (At the Piano) and His Orchestra. Special Entertainment, Nevco Amusement Enterprises, Inc.

Registration Figures

Yesterday's registration figures up to 3 o'clock in the afternoon totaled 2,266. The table shows a comparison with the attendance at approximately the same time for the five previous conventions. In previous years the Purchases and Stores Division met during the first week, while this year they do not convene until the second week.

	1922	1924	1926	1928	1930	1937
Mechanical Division V.....	360	435	600	450	520	322
Purchases and Stores, Div. VI.	13	8	330	318	282	7
Motor Transport, Div. VIII...	....	....	....	13	47	....
Railroad guests	....	....	....	32	272	88
Railroad ladies	148	337	450	549	483	180
Supply men	1,140	1,676	2,050	1,837	1,813	1,415
Supply ladies	281	380	500	434	346	232
Special guests	107	182	175	16	103	22
Complimentary	....	....	....	177	....	....
Total	2,049	3,018	4,105	3,826	3,866	2,266

Mechanical Division Committee Appointments

During the opening session of the annual meeting of the Mechanical Division yesterday two committees to serve during the meeting were appointed by Chairman Burnett. It is the duty of the Committee on Subjects to receive questions from the members for discussion during the time set apart for that purpose and to report to the division those which, in their opinion, are suitable for consideration. This committee consists of John Purcell (chairman), assistant to vice-president (mechanical), Atchison, Topeka & Santa Fe; F. W. Hankins, assistant vice-president—chief of motive power, Pennsylvania, and W. H. Flynn, general superintendent motive power and rolling stock, New York Central.

The second committee is that on Resolutions. The members of this committee are R. G. Henley (chairman), superintendent motive power, Norfolk & Western; A. L. Ralston, general mechanical superintendent, New York, New Haven & Hartford, and F. R. Mays, general superintendent motive power, Illinois Central.

Grand Ball Tonight

One reason why the Entertainment Committee has such a large membership is that 50 members will be required to conduct the grand march at the Grand Ball tonight. The subcommittee of the Entertainment Committee in charge of the event is headed up by A. J. McDonald, chairman, and C. G. Melvin, vice-chairman. The subcommittee, however, will be supported by the entire membership of the Entertainment Committee.

Why Not Ride Free to the Track Exhibit?

The track exhibit this year is admittedly one of the most comprehensive and striking ever presented and well worth the price of a taxi fare from the Auditorium to the Pennsylvania-Reading Seashore Lines' station and back. The hard-working and efficient R.S.M.A. Transportation Committee, however, has secured the use of two buses which operate at frequent intervals for the accommodation of members and guests of the convention. These buses, furnished through the courtesy of the American Car and Foundry Company, are of the Brill City Type powered with Hall-Scott horizontal gasoline engines mounted under the floor. The buses leave the underpass at the front of the Auditorium and deliver passengers direct to the track exhibit, free of charge. What the Transportation Committee cannot understand is why convention members will deliberately patronize taxis when this excellent, expeditious, safe and free service is provided.

Additional Exhibitors

Several companies in addition to those listed in yesterday morning's *Daily* have arranged to have exhibits. These, with some additions and corrections to the list which was published yesterday, follow:

Budd Manufacturing Company, Edward G., Philadelphia, Pa.—C. W. Wallace added to the list of representatives.

Davis Brake Beam Company, Johnstown, Pa.—The names of the representatives published in Wednesday's *Daily* are incorrect. The representatives are Frank J. Lanahan, George W. Fox, Charles K. Stillwagon and J. L. Franciscus.

Mt. Vernon Car Manufacturing Company, Mt. Vernon, Ill.—Reception booth. Represented by T. A. Collison, C. H. Hammond and W. L. Settlemire. Space A-5.

National Twist Drill & Tool Company, Chicago.—Fast spiral locomotive frame reamer; standard spline taper drive boring heads; Boreamer-Cutters with standard holders; Adjusto-lock side milling cutters; inserted blade milling cutters; drills; standard reamers, taps and dies. Represented by Joseph M. Brown. Space LF-12.

Philco Radio & Television Corporation (Battery Division), Philadelphia, Pa.—Storage batteries for all railroad applications. Represented by P. S. Harvey, R. M. Jaccard, J. J. Shallow, M. D. Tracy and T. W. Altrup. Space LH-16.

Rosebury Organization, Inc., Richard, New York.—Space LF-13.

Shelton Looms, The, New York.—S. W. Midgley and R. W. Preikschat are also representing this company.

Standard Railway Fuse Corporation, Boonton, N. J.—Railway fusees and torpedoes; highway fusees. Represented by E. W. Purcell. Space LH-15.

Superior Railway Products Corporation, Pittsburgh, Pa.—This company was listed as having an exhibit in Space A-7; it should be G-7.

Wood Steel Company, Alan, Conshohocken, Pa.—This company was listed under "W" as the Wood Steel Company, Alan, which is incorrect.

Deaths Among Mechanical Division Members

Since the last annual meeting of the Mechanical Division the deaths of the several members have been reported to Secretary Hawthorne and attention was called to their passing in the report of the General Committee presented at the opening session yesterday morning.

Life members: F. W. Brazier, Forest Hills, L. I., New York; S. A. Crone, New York; T. H. Goodnow, Chicago; A. L. Graburn, Toronto, Ont.; W. Kells, Wilington, N. C.; J. E. Mechling, Indianapolis, Ind.; J. H. Nash, Chicago; W. H. Sitterly, Buffalo, N. Y.; F. W. Stubbs, Muncie, Ind.

Members: E. C. Bagwell, chief operating officer, Seaboard Air Line; T. Beaghen, Jr., superintendent car maintenance, Mexican Petroleum Corporation; F. D. Campbell, assistant superintendent car department, Chicago, Milwaukee, St. Paul & Pacific; S. Lynn, superintendent rolling stock, Pittsburgh & Lake Erie; W. J. Ormsby, master mechanic, Illinois Central; R. A. Reid, master mechanic, Pere Marquette; E. Thomason, president, Piedmont & Northern.

Affiliated members: S. K. Dickerson, Cleveland, Ohio; J. Gill, Chicago; J. E. Marden, Portland, Me.; J. G. Platt, South Boston, Mass.; J. C. Ramage, Alexandria, Va.; P. G. Smith, Portland, Me.; T. A. Treleaven, London, Ont; J. A. Turtle, Denver, Colo.

Conventionalities . . .

That broad smile on the face of E. H. Roy, general superintendent motive power, Seaboard Air Line, is by no means synthetic. He's a grandfather of a few weeks' standing.

●

Charley Benz of the Chicago Malleable Castings Company—and particularly Mrs. Benz—feel especially at home here. Mrs. Benz is that rare personage, a native Atlantic citizen.

●

Koujan John Kang, of the Chinese National Railways, who is at present studying at the University of Pennsylvania, was a visitor to the convention yesterday.

●

Visitors from the land of the Rising Sun are N. O. Kimura and K. Yamanouchi, of the Japanese Government Railways, and E. Yasuda of the South Manchuria Ry.

●

Most people know that Doctor A. Giesl-Gieslingen, consulting mechanical engineer, is an Austrian, but few know that his family was for centuries close to the Hapsburg throne, and served the Austrian empire in military and diplomatic capacities.

●

The only woman engineer attending the convention is Miss O. W. Dennis, engineer of service, for the Baltimore & Ohio. To Miss Dennis goes a lot of credit for many passenger service improvements on the B. & O., particularly as applied to women passengers.

●

A former cabinet minister is in attendance at the convention in the person of Colonel Robert P. Lamont, who is now a well-known consulting mechanical engineer in New York. He was Secretary of Commerce in the Cabinet of former President Herbert Hoover.

●

D. G. Cunningham, master mechanic of the Denver & Rio Grande Western at Salt Lake City, when discovered conversing with a number of ladies (including, we hasten to say, Mrs. Cunningham) announced: "When we Mormons come to the convention—we come prepared."

●

Shock-troopers O'Neill, Conneely, Davies, Brown, Aiken, Shoemaker, Fletcher, Keeler and Ruth of the Republic Steel Corporation deserve a great deal of credit for the manner in which they got the excellent exhibit assembled at their shops and produced it here, despite the difficulties under which Republic is now operating.

●

Condolences are due E. J. Heinen, service engineer of the Coffing Hoist Company, who will be two days late getting here, because his wife was compelled to undergo a serious emergency operation. Merrill Miller of Coffing will go directly from the convention to take up his new duties as district sales manager with headquarters at Washington, D. C. One of the most recent graduates in the supply fraternity is J. E. Bookwalter, just out of the University of Wisconsin last week, who is here in the sales department of the Coffing company, of which his father, R. R. Bookwalter, is a partner.

Sounds Fishy

J. J. (Three-Star) Hennessy, president of the Hennessy Lubricator Company, is modest about his business ability, but, when it comes to gardening, he takes a back seat for nobody. His garden this year is simply full of—whoah! Our special investigator rushed in at this moment to inform us that the total production of his many, many hours of labor this year has been one lone tomato. Still, that's better than no tomato. [The reporter turned this item in just as we were about to go to press with this edition. He disappeared before a checkup could be made, but two things are evident, one, that the reporter is no gardener, and, two, he is careless about getting facts. Possibly "this year" should read "last year." Tomato plants have not yet started to blossom around New York—Man. Editor]

Mexican Pictures

T. C. Wurts, sales manager, Heavy Traction Section, Transportation Department, Westinghouse Electric & Manufacturing Company, took a vacation in Mexico in February. Making his headquarters in Mexico City, he studied archaeological and architectural wonders within a radius of 150 miles. He returned with a fine collection of ninety colored pictures.

Changes Jobs

D. P. Morgan has just resigned as railroad representative of the Garlock Packing Company, with headquarters in Philadelphia, and will travel his accustomed southeastern territory as Southeastern Manager of the Okadee Company and its associate company, the Viloco Railway Equipment Company, with headquarters in Atlanta, Ga.

Roller-Bearing Shoulders

If "Guldahl" Harshbarger of the S-K-F Industries has a far-away look in his eyes, attribute it to his Alexander complex. He is looking for new worlds to conquer since, for two years running, he has turned in low gross at the New York Railroad Club outing at the Westchester-Biltmore course, notching a 78 and 81, respectively. Some people have given as the reason for his long, straight drives that he has roller-bearing shoulders.

A Hard Worker

A group of friends of W. H. S. Bateman, familiarly known as "Doc", gave a party in honor of his sixty-ninth birthday on June 3. Doc and his wife have been attendiing the conventions during the past four decades. He has worked hard on R. S. M. A. committees and was president of the association in 1928. That he is still active is indicated by the committee assignments he has this year.

His Honor, the Mayor

Harry B. Oatley, vice-president of the Superheater Company, arrived yesterday morning fresh from Burlington, Vermont, where the dignified directors of the University of Vermont made him a trustee of that institution. Harry, though, is used to honors and to laurel wreaths being draped over his left eyebrow. In Kensington, Long Island, for example, it's His Honor Oatley, for Harry is mayor of that fair municipality.

On the High Seas

George Kelly, the genial vice-president of Pullman, will not be at the convention this year, as he is, at the moment, bouncing along on the high seas enroute to Europe, with Mrs. Kelly and his daughter, Kathleen. It's the first trip that George has ever made across the pond, and, at the moment, if the briny deep isn't too unsteady, George is probably yodeling a happy tune in anticipation.

Retired—But Active!

Among those who are looking over the locomotive exhibits with a practiced and a critical eye is John Draney. When we say "practiced and critical eye" we are by no means overstating the case, for John, until his retirement six years ago, sat in the right-hand seat of a locomotive cab for the Lackawanna for a

few months over a half a century, and has a total service record with that company of more than 58 years. Mrs. Draney is with John.

Lucky Number (?)

Clarence C. Bailey of the General Electric Company has a lucky number, but, alas and alackaday, he didn't profit by it. His convention badge number is 5634, and, while we wouldn't know anything about such things, we are told by some of the less pure that this very same number paid 500 to 1 right here in Atlantic City yesterday, in a game well-known to the unregenerate.

Page Rumania!

The Pullman-Standard booth is a riot of yellow and green, what with large cardboard replicas of the Green Diamond of the Illinois Central and the Union Pacific streamliners. So far as is known, there is no visitor from Rumania here, but, if there were, he would certainly be highly complimented at this lavish use of his country's national colors—yellow and green—of the exact shades used in the booth.

"Daily" Sets the Pace

The music editor of the *Railway Age* takes credit for inspiring the organist on Wednesday morning. Our lead editorial in the daily issue for Wednesday was titled "Happy Days Are Here Again," and hardly had the delegates finished reading it when the organ burst into the tune of that title, in connection with the exhibition hall broadcast by the Mayor and President Sid Down. Incidentally, the music editor reports that both these gentlemen were in excellent voice yesterday morning.

Trimmed Too Close

Richard R. Paradies, of the Beckwith-Chandler Company, is enthusiastic over his new home at Elizabeth, N. J., particularly after being a rent payer for a quarter of a century or so. In his efforts to beautify the property, however, he has done some things that an old-timer would recognize as being disastrous. As an instance, in pruning a beautiful weigela bush he cut it down to a stump. Next time, he says, he is going to call in a horticulturist.

High-Water Mark

One of the interesting sights of the convention, and one that attracts considerable attention whenever B. C. Browning of Oakite Products goes for a swim, is the high-water mark just above his right knee, which was left there by the Ohio river flood. Browning arrived at the Illinois Central shops in Paducah, Ky., along with the crest of the flood and seven carloads of Oakite cleaning compound, and rowed around to render yeoman service during the remarkable recovery that was made by those shops after a complete inundation.

A Touring Veteran

One of the finest retired veterans of the railroad industry is C. E. Schaff, formerly president of the Missouri-Kansas-Texas Lines, and father of Fred Schaff, president of the Superheater Company. C. E. Schaff, who is now 82 years old, is living in St. Louis, enjoying a healthy and rugged old age. Knowing his former practice of himself driving his automobile thousands of miles all over the country on touring trips, the *Daily* interviewed Mr. and Mrs. Fred Schaff yesterday concerning his present habits, and learned that he is still about as big a touring "bug" as ever. He was one of the noblest Romans of them all when he was working, and continues to play the role well in his retirement.

Living Storage Battery

Contrasting with the mechanical engineers' latest accomplishments in travel progress and safety, a curiosity of nature is being exhibited by the Electric Storage Battery Company. The "living storage battery" is an electric eel, which, while swimming in a five ft. aquarium, lights a 120-volt electric lamp from the powerful discharges of its body. This type of eel, native to the Amazon and Orinoco rivers in South America, gives off a potential electrical discharge of from 100 to 500 volts, according to its size and age, which stuns its potential victims and renders them easy prey. So far as is known, this eel is the only creature depending upon electricity as its primary source of attack, defense and sustenance. We feel it hardly necessary to add the well-known fact among supply men and the railroad fraternity that the scientific name of this strange beast is gymnotus electricus.

Staybolts and Golf

The Flannery Bolt booth presents a contrast in faces old and new. E. S. Fitzsimmons, the vice-president, can recall as many conventions as anyone in the hall, while W. T. Kilborn, the new president, and W. C. Masters, eastern sales manager, are here representing Flannery for the first time. An old face that is missing is that of Leo Finnegan, who passed away last March. Bill Wilson, the western sales manager, formed one of a foursome yesterday, the other members of which were George Carr of the Dearborn Chemical, and S. O. Dunn and F. H. Thompson of our own organization. When we inform you that Bill beat that trio of doughty knights of the driver, some idea will be had of the excellence of his game.

Persian Personality

The interesting career of R. C. Mohler took another turn yesterday, when his appointment to the staff of the Railway Accessories Company was made effective. Mr. Mohler, formerly employed by the Baltimore & Ohio, Texas & Pacific, and the *Railway Age*, spent four years in the Orient, representing the Atlantic, Gulf & Pacific Company. He was then appointed mechanical and transportation superintendent of the Southern Persian State Railways, and spent ten years in Persia, during which time he was honored by taking Riza Shah Paliare, then the ruler of Persia, on his first train ride. For three years until his present appointment, Mr. Mohler has been superintendent of motive power of the Cumberland & Pennsylvania.

That Flag Again

H. M. Carroll, of the Hyatt bearings division of General Motors, demands a recount on our measurement of the stripes of the huge flag on the balcony. He claims that the width of 12 ft., as was reported in Wednesday's Daily (the information having been secured from a hitherto reliable source), is slightly haywire, and that, by the use of trigonometry and calculus, and a little plain "figgerin'," he has arrived at a considerably smaller measurement. We haven't yet, and probably won't be able to desert our typewriter long enough to climb up into the rafters and measure it, but we should appreciate hearing from any energetic delegate who does.

Newly-Weds

The right-hand side of the stage in the Exhibit Hall really should have an orange blossom or two among its decorations, to honor the benedicts there. George Hull, vice-president of the equipment specialties division of the Union Asbestos & Rubber Company, was married only recently, and, after a honeymoon on the Pacific Coast—where, incidentally, he induced Phil Nash, western representative at San Francisco, to come to the convention—George settled down to building a house in Highland Park, a beautiful north shore suburb of Chicago. Somebody had to stay and watch the home progress, so George is a disconsolate bachelor for the duration of the convention, since Mrs. Hull stayed home. George L. Green, service engineer in the Chicago office of the Union company, is the other newly-wed, he having recently married Jessie Sparrow, daughter of W. W. K. Sparrow, vice-president of the C. M. St. P. & P. Mr. Green is also holding a reunion with his uncle, Norman Naylor, vice-president of the American Locomotive Company, at the convention.

Mechanical Division Convenes at Atlantic City

The first session listens to addresses by Vice-President Symes and Chairman Burnett

J. W. Burnett
Chairman

THE sixteenth annual meeting of the Association of American Railroads, Mechanical Division, was called to order by the chairman of the division, J. W. Burnett, general superintendent of motive power and machinery of the Union Pacific, at 9:30 yesterday morning at the Atlantic City Municipal Auditorium. The Honorable Charles D. White, mayor of Atlantic City, welcomed the members of the division. Then followed addresses by J. M. Symes, vice-president, operations and maintenance department, Association of American Railroads, and Chairman Burnett. M. J. Gormley, executive assistant, A.A.R., spoke extemporaneously preceding Chairman Burnett's address. Following the chairman's address the minutes of the 1936 meeting were approved and appointments to the committees on subjects and resolutions were made. Then followed the reports of the General Committee, the Nominating Committee and the Committee on Lubrication of Locomotives. During the session J. M. Hall, chief inspector, Bureau Locomotive Inspection, I.C.C., speaking extemporaneously, said that the Commission was going to ask the roads to put shatter-proof glass in the cab windows, doors, front windows and storm windows of steam locomotives because of recent injuries to enginemen. He also mentioned the Bureau's interest in the reduction of noise in motor-car equipment and the necessity of keeping front cab windows clear of snow and ice during the winter. Concluding his remarks Mr. Hall said:

"You know, as we increase speed, we decrease safety, and I know that the wheel manufacturers and the axle manufacturers are sleeping with the problem now to try to bring the factor of safety up to the spot at which our Diesel and our steam locomotives are now operating."

Address of J. M. Symes

More real progress in improving the art of transportation made in the last 10 years than in any previous period twice as long

J. M. Symes

I want to congratulate you on what appears to be the "biggest and best railroad show that has ever been staged." Little did we in the A.A.R. realize, when approving the recommendations of the Mechanical Division and the Purchases and Stores Division, that we were authorizing such a stupendous affair.

The Mechanical Division as such is not a very old organization. It was created in 1919 by the consolidation of the former Master Car Builders' Association and the American Railway Master Mechanics' Association. The Master Car Builders' Association was organized in 1867—70 years ago. Its objects were the advancement of knowledge concerning the construction, maintenance and service of railroad cars and the parts thereof by investigation through committees and discussions in convention. Also, to provide an organization through which the members of the companies they represent might agree upon such joint action as was required to bring about uniformity and interchangeability in the parts of railroad cars—to improve the construction and to adjust mutual interests growing out of their interchange and repairs.

The American Railway Master Mechanics' Association was organized in 1868—69 years ago. Its objects were about the same as the Master Car Builders' Asscciation, but, of course, included all rolling stock. The reasons underlying the creation of these associations 70 years ago are just as apparent today as they were then, and perhaps more so.

The Division provides a medium whereby any problem pertaining to the construction and maintenance of rolling stock of the carriers can be taken, and matters in which all carriers are deeply concerned be considered collectively and uniformly rather than individually. We no longer have a monopoly in the transportation field. It is true we are still competitors in a sense with each other. It is also true that we are pulling together

F. W. Hankins,
Vice-Chairman

O. A. Garber

F. R. Mays

J. Purcell

as an industry with one common object in mind—to provide a superior transportation service that will not only hold the traffic we now enjoy but also secure the additional traffic we so sorely need, and to conduct such transportation service in the most economical manner possible at charges which the public can afford to pay. To do so, we must not have any secrets between ourselves. The Mechanical Division is the necessary link through which the best practices on one railroad can be made available to all railroads. That is why the Division was created, and that is why it must necessarily be continued.

Now, as to the accomplishments of your Division: One needs only to look back at your record over a period of years to determine the importance of the work you have been doing. Certainly the standards you have prescribed and practices you have recommended for adoption have not only advanced the progress of the art of transportation, but if it were possible to express in money the economic value it would be a staggering amount.

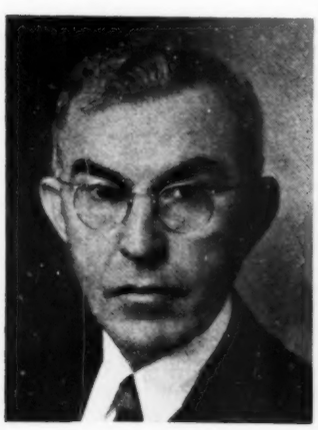
During the past few years we have heard the word "research" used more in the railroad industry than ever before. When I first came to the Association nearly two years ago, like all others, I began looking around for things that should be researched. I found to my amazement that nearly everything I could think of in your division had either been explored and reported on in the past or was in the process of handling through your many committees. I do not mean to convey to you the thought that we have a research organization functioning that is entirely satisfactory. I do not think we will ever reach that degree of perfection. I am saying to you that the railroads, in-

R. G. Henley

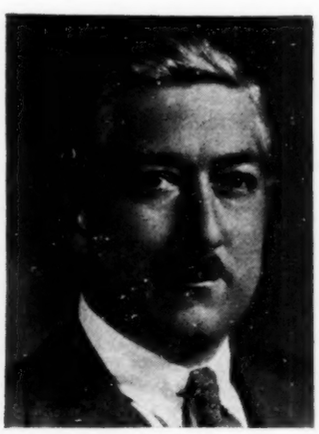
A. L. Ralston

D. S. Ellis

E. B. Hall



J. A. Power



H. B. Bowen

W. H. Flynn

V. R. Hawthorne,
Secretary

dividually and collectively, through the A.A.R. and otherwise, have been very much alive to the importance of determining facts from which can be determined intelligent conclusions, which, after all, is a proper definition of the word "research." We have perhaps not advertised our accomplishments as much as we should have, nor to the same extent as other industries have. That is why the public lacks appreciation of what is being done in the railroad industry.

A 53 per cent increase in the speed of our freight trains since 1920; streamlined passenger trains attaining speeds of 100 miles per hour; air-conditioning; store-door delivery; heavier loading of trains during a period of declining traffic; reduced fuel consumption; improved signals, and 101 other improvements that could be mentioned just did not happen. It required years of development and experimental work to make possible such improvements. I believe that more real progress has been made during the past 10 years in improving the art of transportation than in any previous period twice that long, and that during the next 10 years even greater progress can be expected.

It is my understanding that the Report of the Joint Committee on Utilization of Locomotives and Conservation of Fuel will be presented at one of the sessions of this meeting. That report is going to show a large amount of very valuable statistical information on locomotive efficiency. It will show that since 1920 freight train speeds have been increased 53 per cent; gross tons per train have increased 29 per cent; gross ton-miles per train hour have increased 96 per cent; gross ton-miles per active locomotive day have increased 50 per cent and coal consumption per locomotive-mile has decreased 14 per cent.

It is true that during the same period the tractive force of our locomotives has been increased 33 per cent, but even so, with 50 per cent more work done by the locomotive and at the same time with a 14 per cent saving in fuel consumption, it is rather an enviable record. It seems to me that notwithstanding this remarkable record there remains a lot to be done in increasing efficiency in so far as locomotive utilization is concerned. I am, of course, favorably impressed with a 53 per cent increase in our freight train speeds since 1920, but not favorably impressed with 105 miles per day per active locomotive. It is true that this is an all-time record, and 100 miles per day used to be our goal, but it is only 15 per cent greater than during 1920. We work our active freight locomotives an average of only 5 hr. and 29 min. per day, whereas in 1920 we were working them 7 hr. 28 min.

If we were working them now the same number of hours per day that we were during 1920, instead of getting 105 miles per day we would be getting about 140 miles per day. The locomotive represents a tremendous investment and it seems to me that the operating and mechanical officers of all carriers should be continuously studying this problem with the idea of getting more work out of this large investment. I would like to suggest to this meeting that the mechanical officers and the transportation officers of each carrier make this subject the matter of a complete and comprehensive survey to the end that an improvement will be made in locomotive utilization in keeping with other achievements attained during the past 17 years.

In closing, in behalf of the A.A.R. I would like to extend our appreciation to the Railway Supply Manufacturers for making it possible to hold this wonderful exhibit; our thanks to the railroads for permitting so many of their mechanical officers to attend this convention, which I am sure is going to be beneficial to all, and our thanks to you gentlemen who are so generously contributing your time and wisdom to the affairs of the Mechanical Division.

Address of Chairman Burnett

Despite the years of the depression, a number of important improvements have been made in designs of cars, locomotives and appurtenances; also many new designs of equipment, both motive power and cars, have been developed, such as the Diesel-electric trains, high-speed passenger engines and the high-speed steam-turbine electric engine. It is entirely fitting at this time that we give recognition to the foresight and vision of our friend John Purcell, who, in his address at the convention here in June, 1924, said: "There are two revolutionary changes in locomotive design which are engaging the thought of many prominent engineers. These are the turbine locomotive and the Diesel locomotive.

Our European neighbors have gone further in this work than we, due probably to the high cost of fuel. However, it is our belief that in the near future there will be designs of these types made by American engineers to suit the requirements of American railroads which may revolutionize locomotive construction. It appears that the Diesel locomotive has reached the stage where it will, in itself, be a satisfactory unit of power, without undue weight."

All of you are familiar with the advancement made in the last few years in the use of Diesel power on American railroads. It is now a recognized unit on many high-speed, light-weight trains. The modern improvements and advancements in locomotive construction in this country should be given no small credit for making the American public once more railroad minded, as evidenced by increased passenger traffic and car loadings.

It has been several years since exhibits of railway equipment and appliances have been available to us, principally due to the depression, but the supply manufacturers have this year prepared for our benefit an extensive, interesting and instructive exhibit, and I am sure all of you will take full advantage of opportunity afforded to study the devices which are on display. For your benefit and convenience, no sessions of the convention will be held in the afternoons, which will give you full opportunity to inspect all of the exhibits.

Report of the General Committee

Formal approval of the membership requested on actions taken since last annual meeting

The membership of the Division at the present time includes 142 railway systems, full members of the Association of American Railroads, and 198 railways, associate members of the Association of American Railroads. These railroads, members and associate members of the Association of American Railroads, have appointed 903 representatives in the Mechanical Division. In addition, there are 582 affiliated and 372 life members in the Division.

The last session of the Division was held June 25 and 26, 1936. The subjects of major importance on which the General Committee has taken action since that time are briefly outlined in the following report, and your approval is respectfully requested.

Annual Meeting, 1937

After careful consideration, it was decided that the Annual Meeting for 1937 should be enlarged in scope and should be held at Atlantic City, New Jersey, in connection with a complete exhibit of railway equipment and appliances. The various standing committees of the Division have prepared comprehensive reports and recommendations and the members are urged to

discuss these reports freely in order that the recommendations may be fully understood and appropriate action taken. The members are also urged to inspect the fine exhibit which is being presented for your information and convenience by the Railway Supply Manufacturers Association.

Loading Rules

The recommendations from the Committee on Loading Rules considered at the 1936 Annual Meeting and approved by letter ballot were included in a reissue of the Rules effective January 1, 1937. The Committee is also cooperating with the Joint Committee on Prevention of Loss and Damage in connection with recommended methods for securing commodities loaded in closed cars. The Committee is receiving splendid cooperation from the shippers in developing safer and more economical methods of loading materials.

Complaints were received that some railroads were accepting open-top cars on which loads were not secured in accordance with the Loading Rules. Under date of December 4, 1936, a special circular was sent to the members urging that proper instructions be issued to all concerned that no loads will be accepted or offered for movement which do not comply with the Rules Governing the Loading of Commodities on Open Top Cars.

Application of AB Brakes

As of March 31, 1937, 116,548 railroad-owned and 13,300 private-line cars were equipped with AB brakes meeting the requirements of the specifications for freight air brakes adopted in 1933.

Investigation of Automatic Train Line Connectors

Report of the Joint Committee on Automatic Train Line Connectors together with recommendations contained therein has been approved by the General Committees of the Operating and Mechanical Divisions and by the Board of Directors of the Association of American Railroads.

Mechanical Inspection Department

The Mechanical Inspection Department of the Division has continued throughout the year making investigations covering repairs to foreign cars and billing therefor. Where definite overcharges have been found as a result of these investigations, refunds have been made to the car owners, in accordance with the Rules of Interchange. This department has also conducted a number of special investigations by direction of the Arbitration Committee.

Extension of Effective Dates of Rules and Regulations

As occasion has arisen your Committee has, upon recommendation from proper committees of the Division, extended the effective dates of certain provisions of the rules and regulations of the Division.

I. C. C. Docket 24049—Mechanical Stokers

In the hearing before the Interstate Commerce Commission in connection with the complaint of the Locomotive Service Brotherhood's request for an order to require the application of mechanical stokers on all coal-burning locomotives, the presentation of evidence has been concluded and briefs are being prepared and filed by counsel.

I. C. C. Docket 24050—Power Reverse Gears

The rehearing before the Interstate Commerce Commission in connection with complaint of the Locomotive Service Brotherhoods' request for an order to require the application of power reverse gears on all steam locomotives was concluded on March 5, 1936. Brief was filed with the Commission by the General Counsel of the Association in behalf of the member roads. A proposed report, by the Examiners hearing this case, has been considered and exceptions filed by the General Counsel of the Association. Oral argument was held before the Interstate Commerce Commission on May 18, 1937.

Hazard to Transportation Account Failure of Arch Bars

As of March 31, 1937, there remained 738,460 railroad-owned interchange freight cars, or 19.8 per cent; 60,675 private-line cars, or 21.7 per cent, or a total of 439,135 freight cars, or 20.1 per cent, equipped with arch-bar trucks. The Board of Directors of the Association, at a meeting held March 27, 1936, decided that the effective date of Interchange Rule 3, Section (t), paragraph (4) would not be extended beyond January 1, 1938.

Inspection and Maintenance of Draft Gears and Attachments by Car Owners

Under date of December 4, 1936, Circular No. D. V.-889 was sent to all car owners requesting that all railroads and private-car owners take prompt action to follow the prescribed methods of draft-gear inspection and maintenance on their own cars and thus avoid the necessity of the Association's setting up rules to make this practice mandatory. All car owners were also requested to submit copy of existing instructions relative to this subject or copy of such instructions as might be issued at that time to carry out the intent of the Recommended Practice on this subject. This Recommended Practice was reprinted in Circular No. D. V.-889 and will also be found on page 141-1936, Section L, Manual of Standard and Recommended Practice. Practically all railroads and private car lines have filed copies of their instruction which provides for inspection and maintenance of draft gears in accordance with the Recommended Practice of the Association.

Axles

After very careful consideration your General Committee requested approval of a program of intensive research on passenger-car axles, locomotive axles and freight-car axles by the Director of Equipment Research of the Association, under the supervision of a joint subcommittee of the Committee on Car Construction, Committee on Wheels, and the Committee on Locomotive Construction. This request was approved by the Board of Directors of the Association and an initial appropriation was granted to carry on this work for the balance of this calendar year.

This investigation will include passenger-car axles, locomotive axles and freight-car axles, and cover every phase of the subject, including designs, materials and service. The research work on the passenger-car axle is being given preference in progressing this study.

[The committee also presented routine reports on the letter ballots covering the recommendations of the committees received at the 1936 annual meeting and special ballots on definitions and designating letters for cars and on interchange rules 3 and 112 to bring them into conformity with accounting rules and requirements of the Interstate Commerce Commission as modified in connection with I.C.C. Docket 15100. The results of all of these have previously been made known by circulars to members.—Editor.]

The report is signed by J. W. Burnett (chairman), general superintendent motive power and machinery, Union Pacific; F. W. Hankins (vice-chairman), chief motive power, Pennsylvania; D. S. Ellis, chief mechanical officer, Chesapeake & Ohio; E. B. Hall, general superintendent motive power and machinery, Chicago & North Western; W. H. Flynn, general superintendent motive power and rolling stock, New York Central System; J. A. Power, superintendent motive power and equipment, Southern Pacific Lines in Texas and Louisiana; H. B. Bowen, chief motive power and rolling stock, Canadian Pacific; O. A. Garber,

chief mechanical officer, Missouri Pacific Lines; F. R. Mays, general superintendent motive power, Illinois Central System; J. Purcell, assistant to vice-president, Atchison, Topeka & Santa Fe; R. G. Henley, superintendent motive power, Norfolk & Western, and A. L. Ralston, general mechanical superintendent, New York, New Haven & Hartford.

(*A motion to approve the report as read by the secretary was seconded and carried.*)

Report of Committee on Nominations

Officers' terms do not expire until next year—Retiring members of General Committee renominated

The terms of office of the chairman, J. W. Burnett, general superintendent motive power and machinery, Union Pacific, and vice-chairman, F. W. Hankins, chief of motive power, Pennsylvania System, do not expire until June, 1938.

The terms of four members of the General Committee expire in June, 1937, and your Committee nominates these four members to continue to serve on the General Committee until June, 1939: H. B. Bowen, chief of motive power and rolling stock, Canadian Pacific; W. H. Flynn, general superintendent motive power and rolling stock, New York Central System; E. B. Hall, general superintendent motive power and machinery, Chicago & North Western; J. A. Power, superintendent motive power and equipment, Southern Pacific Lines.

Sections 7 (b) and 7 (c) of the Rules of Order of the Division provide for the election of officers and members of the General Committee of the Division by written or printed ballots. In the interest of economy it is recommended that the use of ballots be dispensed with for this year and the members of the General Committee be elected by viva voce or a rising vote.

The report is signed by J. J. Hennessey (chairman), assistant superintendent car department, Chicago, Milwaukee, St. Paul & Pacific; J. Purcell, assistant to vice-president, Atchison, Topeka & Santa Fe; T. W. Demarest, general superintendent motive power, Pennsylvania, and W. H. Flynn, general superintendent motive power and rolling stock, New York Central.

(*A motion to approve the report was seconded and carried.*)

Report on Lubrication of Locomotives

High speeds in passenger and freight service have introduced new problems in the lubrication of both steam and Diesel Locomotives

G. W. Ditmore
Chairman

Steam Locomotives

Since 1929 increased speed and extended locomotive runs in both freight and passenger service have become more general and these changes in operating conditions have brought about changed practices or have at least served more thoroughly to establish experimental practices in order to better adapt steam locomotives to the service now expected from them. Changes in practice are particularly evident on locomotives recently built or on order, and on locomotives which have been converted to meet the changed conditions. The adoption of roller bearings on engine trucks, driver, trailer, and tender trucks must certainly be given consideration in connection with lubricating problems. The application of roller bearings to main and side rods, while admittedly in the experimental stage, as well as the adaptation of roller bearings to valve gear, is attracting a great deal of attention.

Roller Bearings

Of course, the extended use of roller bearings necessitates a change in the lubricant used. While it is difficult to attempt a specification for oil for roller bearings it is generally conceded that the viscosity, pour point and film strength must be considered. Mineral oil with a fairly low pour point to avoid congealing in cold weather operation, viscosity of approximately 180 to 210 and a high film strength appears to meet general specifications. This oil would be equivalent to a cylinder oil, which preferably should be de-waxed and free from animal fats and other compounds.

There is a noticeable improvement in what was formerly considered more or less conventional practice in the lubrication of side and main rod bearings. The application of pressure-fed hard grease lubrication through a spring loaded fitting has eliminated the conventional grease cup and plug and the attendant lubrication hazards resulting from the possibility of foreign matter in the grease which was formerly applied through an opening approximately 1¼ in. in diameter.

The mechanical lubricator particularly lends itself to the increased demand on valve and cylinder packing rings and bushings as the result of high-speed runs over extended territories.

To obtain increased capacity necessary for extended runs mechanical lubricators are now available with 40-pint capacity. Some roads have utilized existing lubricators by applying one lubricator to each side of the locomotive with one lubricator piped to the valve chambers and the other to the cylinders. This insures some lubrication in the event that either lubricator fails en route.

Soft Grease

There seems to have been a falling off in the interest shown in soft grease lubrication to brake and spring rigging. Many roads report that the soft grease lubrication to spring rigging has not proved satisfactory due to the fact that it is impossible to apply the grease at the point of greatest bearing pressure. This condition is being met by the application of hardened pins and hardened bushings which in many cases are ground to close tolerances and in some cases are used without any other lubricant than that applied at the time of installation. Soft grease has proved satisfactory on locomotive brake rigging where the loads are varied and the grease has better access to the pin and bushing, but the application at this point in many cases is also being superseded by the use of hardened pins and bushings and no lubrication.

Mention has been made in previous reports of the use of soft grease for the lubrication of hubs, frame pedestal, and shoe and wedge faces. This has not proved entirely satisfactory, especially on the shoe and wedge faces, first, due to the excessive amount of grease used and wasted through improper servicing, and further, some difficulty has been experienced in getting satisfactory distribution of the grease to both faces of the wedge on certain designs of wedges and as a result many roads are turning to mechanical force-feed lubrication at these

locations. This has been facilitated by the development of various oil splitters or dividers which divide the oil discharged from one pump in the mechanical lubricator to from two to five discharge points, and on the new locomotives, and especially those equipped with roller bearings, this system is being incorporated for all pedestal faces on locomotive engine trucks, drivers and trailers, as well as hub liners, and is also being coupled up to the sliding boiler bearings and flexible steam-pipe connections on the Mallet locomotives. The application of dividers permits the use of the mechanical lubricator for lubricating steam cylinders of air pumps, boiler feed pumps, stoker engines, and booster engines, and the application to these locations has greatly increased. Some roads are using cylinder oil from existing mechanical lubricators for this purpose, others are applying an additional mechanical lubricator with sufficient feeds to take care of the points mentioned above and in addition, valve crosshead guides and main piston guides. Some roads which have not extended the practice to pedestal faces have coupled up an available feed from the valve oil lubricator to lubricate the main guides.

Soft grease pressure system of lubrication appears to be increasing in popularity for valve motion. This application to existing locomotives is comparatively simple. The principal problem appears to be the link-block pins and it is necessary to provide ample capacity at this location to avoid servicing these bearings en route on runs of 500 miles and over.

There have been no marked changes in the practices in lubrication of waste-packed engine truck, trailer or tender trucks, although numerous spring-loaded wool pads have been and are being tried out, as well as improved dust guards. At present none of these have been developed to the point that would appear to justify general adoption.

Driving Journals and Crank Pins

Hard grease fed by means of a spring loaded pressure plate through a perforated screen is still the most common practice for lubrication of friction-type driving journals. However, there are a considerable number of locomotives operating satisfactorily with oil lubrication, either through means of a waste-packed cellar fed from a mechanical lubricator or through a cellar equipped with pads and an independent pump operated by the lateral motion of the locomotive. Several roads have made a considerable number of applications of an independent pump and report very satisfactory results both as to freedom from hot bearings and reduced internal friction. One road reports that for the past five years it has operated 73 yard locomotives and two 4-6-2 Pacific type locomotives with force-feed lubrication using valve oil direct to the journal bearing and hub faces and with pads serving merely as a secondary or emergency means of lubrication. They further advise that these locomotives are noticeably free from internal friction and that it has not been necessary to make any bearing renewals during this period.

While hard grease, either with the conventional grease plug or the pressure fitting, is the most common practice for crank-pin lubrication, there are a great many locomotives in switching service which have been equipped with soft-grease lubrication using the same grease commonly used in pressure fittings on valve gear and pedestal faces as a lubricant. The application of soft grease to crank pins is easily accomplished since it requires merely a reduced opening from the grease cup to the pin and the application of a cap and fitting for connection to the pressure gun. Reports indicate that this practice has proved entirely satisfactory, has reduced terminal servicing, eliminated attention by engine crews, and has resulted in increased mileage between bushing renewals.

Air Pump Lubrication

Several types of mechanical lubricators have been developed for application and use on air pumps. These lubricators are dependent upon the working of the pump for their action and are designed to lubricate either the air or steam end of the pump, or both. They seem to have a particular adaption to locomotives on which the air pumps are mounted at the head end of the locomotive and which locomotives are equipped with mechanical lubricators for lubricating valves and cylinders and motion work, since they permit the abandonment of the hydrostatic lubricators in the locomotive cabs.

A number of roads are using a semi-fluid grease on a considerable number of locomotives for lubricating the air end of the air pump. This appears to have proved generally satisfactory and especially to the extent that it seems to eliminate the accumulation of carbon back of the rings and in the ports of the valve to the pump. This grease is being used successfully with the conventional oil cup furnished by the various air-brake equipment manufacturers, but on locomotives assigned to extended runs a larger oil cup is desirable since it eliminates the necessity for attention at intermediate terminals.

Lubrication of Boiler Supports and Buffer Castings

The Committee finds that probably the most common complaint with regard to inadequate lubrication is in sliding furnace bearing supports. Various methods are being tried out, soft grease, oil fed from oil cups, and even oil from mechanical lubricators. The sliding plates have been made from bronze and spring steel and it appears to the Committee that to obtain satisfactory lubrication at this point a change in design as well as in the method of lubrication is necessary. It is apparent that greater bearing areas are required at this location, that materials for bearing plates must be especially resistant to wear, and that a regular supply of lubricant must be provided, and they recommend further study of this particular item.

Lubric tion of chafing castings or radial buffer castings between tank and engine presents a general problem and there is a diversity of ideas as to how this problem is to be met. First, there is lack of agreement as to whether or not lubrication should be applied at this point. Some claim that the lubricant picks up cinders, road dirt and particles of coal which act as an abrasive and increase wear; however, we find that these bearing faces are being lubricated by soft grease, by the occasional use of a hand oiler and through the medium of an oil cup. A few roads seem to have solved the problem, at least to their own satisfaction, through the use of high manganese castings made from low carbon steel treated in an electric furnace to obtain from 12 per cent to 13 per cent manganese and then subjected to normal heat treatment, with a normal Brinnel hardness around 200. Manganese appears to be the one material that does not require an opposing metal of dis-similar material to obtain the best results as a bearing and, when used in this location, wear does not seem to be increased through lack of lubrication.

Valves and Cylinders a Problem

An outstanding problem to be met in present day steam locomotive lubrication is the problem of lubricating valves and cylinders of modern locomotives designed to operate on long runs with steam pressures of from 250 lb. to 300 lb. at sustained speeds as high as 90 m. p. h., producing piston speeds of from 1,800 ft. to 2,000 ft. per minute and cylinder temperatures of from 725 deg. to 750 deg.

A number of roads are meeting these conditions with available oils but an improved cylinder oil is necessary. Your Committee is not prepared to submit a recommended specification; however, we can advise that to meet this situation in all probability we will require a heavier body cylinder oil to produce a higher viscosity and an increase in flash and fire point. This no doubt will necessitate an improvement in refining practice. The specifications may be only slightly different from the specifications covering oils now in use, but in some manner the refiner must build into the oil or at least improve the oil to provide improved lubrication to meet the demands of present day service. Your Committee proposes to extend their efforts during the coming year to determine a definite recommendation in this respect.

Diesel Locomotives

Two hundred and fifty-four rail Diesel locomotives have been placed in service since 1925 and recent developments have accelerated the rate of installation. This type of power was first adapted for use in switching service. The early

units were equipped with power plants capable of developing 300 hp. or less. Gradually the use of this equipment has been extended to heavier switch and transfer service with power plants of 600 to 1,800 hp. and finally to passenger service with power plants capable of developing 3,600 to 5,400 hp. and of handling high-speed passenger trains consisting of from 12 conventional passenger and Pullman cars to 14 specially built light-weight cars.

In passenger service these power plants are operated on continuous runs in excess of 2,000 miles, are subjected to changes in elevation from sea level to 8,000 ft. above, and on a single trip during the winter months may be subjected to changes in temperature all the way from 30 deg. below zero to 70 deg. above and in summer to temperatures well over 100 deg. and in addition are subjected to all the hazards of operation through the dust bowl of the middle and southwest. In order to meet these conditions the problem of lubrication has required most careful consideration.

In consideration of this problem it may be well to consider briefly the development of the Diesel engine during the 43 years of its existence, since there have been many changes necessary to adapt this type of power to high-speed rail service. The early models were slow-speed, in the neighborhood of 150 to 250 r. p. m., extremely heavy and cumbersome, weighing in the neighborhood of 250 lb. per hp. and with low specific outputs. These early engines, however, gave thermal efficiencies in excess of 35 per cent. Today, our modern high-speed Diesel used in railroad service weighs in the neighborhood of 20 lb. per hp. and operates continuously at speeds of 900 r. p. m., and both four cycle and two cycle engines are being used successfully with solid fuel injection.

The older and slow-speed models of Diesel engines were generally lubricated by a mechanical lubricator which metered a definite number of drops per minute to engine bearings and engine cylinders. That method has been, and still is, successful for low-speed engines of around 200 r. p. m., with a low specific output. Obviously, this method could not be generally applied to the higher-speed engines running over 900 r. p. m. because of difficulties in timing the drops of oil. At present the most popular form of engine lubrication is the full circulating type, where all main and connecting rod bearings are fed, under pressure, through drilled passages. Cylinders are lubricated by oil thrown from the crank-pin bearings. Many engine builders have drilled passages in the connecting rod to lubricate the piston pin under pressure.

The trend toward the two cycle Diesel as well as the demand for increased output has resulted in a tendency to the use of superchargers either of the Roots blower type or the centrifugal type. These of course are used to improve scavenging and to increase the density of the charge of intake air and have resulted in increases up to 50 per cent in the maximum power output. However, these superchargers with years of service behind them in other fields offer no increased problem of lubrication when adapted to the Diesel rail power plant. The same is true of motor bearings both for the armatures and axle mountings. The journal bearings on both power and trailer wheels offer the same problem as is found in other rail equipment, but for these locations there is general trend toward the use of roller bearings.

Lubrication of Engine Bearings and Cylinders

The real problem in Diesel lubrication is the lubrication of engine bearings and cylinders, which for rail service is complicated by the variation and extremes in operating conditions previously mentioned.

We are unable to apply any yardstick to the Diesel engine and select the ideal lubricant from a given set of specifications. The selection of an oil depends primarily upon the particular engine design, conditions of operation, atmospheric temperatures encountered, and the mechanical condition of the engine. There is no set rule which we can follow, but we must rely upon our experience with similar engines and similar oils when choosing a lubricant for a new design.

Since most of the modern engines use the same oil in the circulating system for engine bearings and cylinders, we shall confine our consideration to this type. Perhaps the most critical section to lubricate in a Diesel is the area around the piston rings and pistons and the item of rings sticking should be given the closest consideration. As we increase the specific power output of these engines more heat is radiated to water jackets, valves and piston heads. The design of pistons can, in a large measure, affect the temperature of a lubricating oil around the ring belt area. If, through improper design, heat is not properly carried away from the head of the piston and the ring belt area into the cooling water, the temperature will build up to such a point that the oil will cook and form a hard gummy substance that will lead to early ring sticking, and ring sticking is about the most serious factor involved in the lubrication of a Diesel engine. This is aggravated by the inherent design of the Diesel engine which requires an excess of air for combustion as well as scavenging, which of course creates an ideal condition for the formation of carbon.

If the engine designer uses great care in the designing of piston and the selection of material he will be able to conduct that part of the heat which is absorbed by the head of the piston more rapidly from the ring belt area into the water jacket, thereby lowering the temperature around the top part of the piston. The lower temperatures to which the lubricating oil will be exposed in back of the piston rings will no doubt greatly prolong the period between overhauls and decrease the ring sticking tendencies.

As the specific power outputs of the high-speed Diesel engines are increased, a proportionately larger amount of heat will be given off to the lubricating oil. In order to keep the oil temperature in the crankcase below the critical temperature, or about 195 deg. F., maximum, oil coolers are coming into increased use. As demands are being made continually for greater power output, engine designers will probably raise the engine speed. Higher speeds, likewise, will increase the oil temperatures and will still further increase the necessity for an oil cooler. Experience to date has demonstrated the need for an efficient air strainer to exclude roadbed grit as well as dust from the atmosphere. The load factor should influence the grade of a lubricating oil. An engine in switching operation, at low speeds, and used for short hauls, will require a lighter oil than one used for long haul operation at very high speeds and near the maximum power output.

Obviously, atmospheric temperatures will affect the selection of a lubricating oil. For example, if switching engines remain outside in the yards during the winter months, where low atmospheric temperatures prevail, a much lighter grade will be needed in order that the engine may be started easily on the following morning.

Engine wear means increased clearance between pistons and cylinders, and shaft and bearings. Increased clearances will permit more oil to escape from the bearings and past the pistons; accordingly, a heavier grade of lubricating oil may be found helpful to offer temporary relief for this condition.

Diesel engines in rail service are operated under conditions much more severe than in stationary or marine practice, due particularly to the fact that the units operate through changing temperatures and atmosperic conditions. They are subjected to roadbed grit and dust from the atmosphere and in spite of the efforts to shield the valve assembly from grit and dust, these are always present in varying quantities and at best, when combined with normal carbon deposits, result in sluggish valve action. When this action has been retarded to the point that it causes valves to stick it reduces the cylinder pressure, permits excessive accumulation of lubricating oil above the piston and is a prolific source of excessive carbon deposit back of the rings. Experience has indicated to operators and manufacturers the necessity for ample lubrication of the valve stems in an effort to eliminate the possibility of sticky valves, since sticky valves from any cause are a major factor in the maintenance of the Diesel engine through damage to the valves themselves, cylinder heads, and the tendency to form excessive carbon around the rings.

Properties of Diesel Lubricating Oil

Physical or laboratory tests upon a lubricating oil provide a mean of describing the properties of the product. These tests, such as viscosity, carbon residue, pour, flash, fire, etc.,

are useful in specifying an oil for a given engine and serve as a guide in the selection of the lubricant but cannot be taken as a guarantee of performance without a thorough field test in the particular service in which it is to be used.

Viscosity is a measure of the body of the oil and is the most important test. In a plain bearing having a fluid film separating the surfaces, the viscosity of an oil at the operating temperature determines the bearing friction, heat generation, and the rate of the flow under the given conditions of speed and bearing design. The oil should be heavy or viscous enough to maintain a fluid film between the bearing surfaces, in spite of the pressure tending to squeeze it out. An oil which is too heavy will create unnecessary friction and loss of power. The viscosity of an oil decreases rapidly with increase in temperature; therefore, the viscosity should be measured at the operating temperature of that particular part of the engine which the oil is to lubricate. For example, if the temperature of the oil in the crankcase runs at 130 deg. F., it would be well to select an oil with a given viscosity at that temperature. Lighter oils have the advantage of creating less friction, easier starting, and will leave lower residues of carbon. They will also more satisfactorily perform the function of carrying heat from one part or bearing to maintain a more generally uniform temperature. Heavier oils have the advantage of lower consumption and slightly better piston ring seal, especially when engines have become worn.

The next most important test for Diesel lubricating oil is carbon residue. This test gives an indication of the amount of carbon that would be deposited in back of the piston rings and in the combustion chamber. A low carbon residue is desirable in order to be assured of freedom from excessive deposits behind the piston rings and on valve stems. The type of deposit is also important; a deposit which is hard and brittle and difficult to remove is much more serious than a softer gummy deposit.

The pour point of an oil is that temperature at which oil will just flow under controlled testing. This test serves as an indication of the suitability of the oil for cold weather operation.

Flash point is of little importance in new lubricating oils for Diesel engines, since practically all are sufficiently high to eliminate an explosion hazard in the engine. Flash point may be of value when considering lubricating oil in engines in service which may have become diluted because injection nozzles are not operating properly.

Gravity is of no importance to the buyer of oil. Whether an oil weighs 7.3 or 7.8 lb. per gallon will not forecast the ability of this oil to give freedom from ring sticking and general lubrication.

The film strength, or the oiliness property of a Diesel lubricating oil, is of little value. A straight mineral oil will provide from four to five times greater film strength than is required in the most modern Diesel engines, since bearing pressures rarely exceed 1,000 lb. per sq. in. Cylinder wear is principally the result of corrosion, and not abrasion, and is largely due to chemical action resulting from the products of combustion of the fuel oil. Therefore, an increase in film strength could hardly be expected to decrease the cylinder liner wear. Compounds which are sometimes added to the oils to raise the film strength may destroy the stability and resistance of this oil and may tend to form harmful sludge deposits.

Viscosity index is a method arbitrarily chosen for designating change of viscosity with temperature of different types of oils. Since the modern Diesel engine for railroad service operates essentially at constant speeds, and since the oil should be chosen with a certain viscosity at the operating temperature, viscosity index has, therefore, little value. This test does not forecast the ability of the oil to offer good stability, good lubrication, and freedom from deposits around the piston ring; however, the viscosity of the oil at the lower temperatures should not be so high that oil will not flow when starting a cold engine.

As previously pointed out, physical tests serve their greatest purpose as a guide to the proper selection of a lubricating oil, but an effort to obtain this product strictly on a specification and price basis may lead to the use of an ordinary low priced machine oil or even a highly refined Diesel engine oil, either of which may be made to conform to a given set of specifications but which would prove entirely unsatisfactory in actual service.

Field Tests of Oils

Finally, then, practical or field tests of Diesel lubricating oils are the most positive and final proof of the ability of the product to give good lubrication, freedom from ring sticking, absence of excessive carbon deposits, and good resistance to sludge. There is no physical test commonly made in the laboratory which could accurately predict the tendency of the lubricating oil in this direction. Prominent oil companies find it necessary to resort to the actual operation of Diesel engines in their study of this phenomenon. It is impossible to make any distinction that a naphthene or paraffin base oil will definitely eliminate ring sticking, but it is generally conceded that the naphthene base oils tend to give less trouble in this respect in many engines.

Serious thought should be given to establishing regular maintenance schedules where engines are dismantled, inspected, and overhauled, and that this period should come at a time well before the point when a condition of ring sticking might occur. This is a problem which must be solved by each individual operator. To stretch the period of engine over-haul might result in damaged engines, costly delays and expensive repairs.

It is greatly urged that pistons should be pulled at uniform intervals and examined to determine the extent and nature of deposits, especially around the rings. Note should be made of the number of hours or miles of service since last overhaul, number of stuck rings, the extent of sticking, and any evidence of lack of lubrication. The operator may even collect the deposits behind the rings, weigh them, and record the information for future reference.

Lubricating oils in the high-speed Diesel have a tendency to thicken slightly in prolonged service. This is brought about by the oxidation of oil and the addition of free carbon from blowby. A dilution of the lubricating oil in excess of four per cent should be investigated. Spray nozzles which may be dribbling and not properly closing are a common source of dilution of the lubricating oil.

Crankcase sludges may occur to such an extent as to be dangerous. Essentially it is an emulsion of water and lubricating oil with free carbon from blowby, and may be somewhat permanent in nature. More than a gallon of water is formed as one of the products of combustion for each gallon of fuel burned, and small quantities of this escape past the pistons into the crankcase. When temperatures of the engine crankcase are held below 130 deg. F. condensation of this water vapor will be very rapid. This condensed water vapor, when agitated with the lubricating oil in the oil pump, will promote an intimate mixing. Other products from combustion of the Diesel will contaminate the lubricating oil to a point where the ability of the oil to separate from the water is tremendously reduced. Two conditions, therefore, will aggravate this sludge forming tendency: first, too low operating temperatures, hence we should attempt to keep the crankcase temperature 130 deg. F. and the water jacket around 160 deg. F.; second, badly worn engines with excessive blowby. The latter condition can only be corrected by an overhaul. Sludge emulsions are very dangerous since they can easily stop off the flow of oil through the oil-sump strainer screen, which will cause an early failure and seizure of the engine. This condition can only be avoided by the use of an oil of high quality and by maintaining engine temperatures within proper limits, and by over-haul of engines at uniform periods.

Oil consumption is a factor in practical operation which we naturally consider the most important item. This factor should be second in importance to the ability of an oil to prevent ring sticking. Oil consumption varies widely with different engine designs. It will vary with different load factors; it will vary with different engine speeds. It is practically impossible to compare two oils on the basis of oil consumption, because, in general the gradual increase in wear, and consequent increase in consumption will make it impossible that this comparison will be accurate.

The report is signed by G. W. Ditmore (chairman), master

car builder, Delaware & Hudson; P. Maddox, superintendent car department, Chesapeake & Ohio; E. Von Bergen, general air brake, lubricating and car-heating engineer, Illinois Central; H. P. Allstrand, principal assistant superintendent motive power and machinery, Chicago & North Western; E. L. Johnson, engineer of tests, New York Central and J. R. Jackson, engineer of tests, Missouri Pacific.

Discussion

H. H. Lanning (A. T. & S. F.): A modern steam locomotive in fast passenger service should be able to run continuously for at least 200 to 250 miles between stops for water and about three times as far between fuel stops. With facilities of adequate capacity properly arranged with respect to stations, fuel and water can be taken within three to five minutes while crews are changing and station work is in progress. This allows very little time for attention to bearings—certainly not enough for filling grease cups or the repacking of driving or truck boxes; consequently we must design bearings and provide for lubrication to run for more or less indefinite distances without attention.

Fulfillment of these conditions requires the utmost in quality and effectiveness of lubricants, together with the very best in lubricating appliances or processes. It is also imperative that the work of refilling or repacking lubricators, oil cups, grease cups, cellars, etc., be confined to terminal points, as we must abandon the thought that these operations can be performed at water stations and other intermediate points.

The lubrication of locomotive valves and cylinders has always been, and still is, accomplished with more or less difficulty. Improvements in valve and cylinder lubricants have just about kept pace with increased temperatures and pressures, but in view of the prospect of further increases in temperature and pressure, the lubricants now in use may be found wanting. I am glad to learn that the committee contemplates a study of valve and cylinder lubricants next year.

The use of dissimilar metals in packing rings and valve or cylinder bushings has greatly facilitated the lubrication of valves and cylinders in locomotives carrying working pressures up to 300 lb., and further developments of such metal combinations may make it possible to lubricate pistons and valves satisfactorily at still higher temperatures and pressures, especially if better lubricants can be had.

Recent experience of several railroads has shown that marked improvement in valve and cylinder lubrication on bad water districts has resulted from the use of either the automatic or continuous blow-off systems and further improvement along these lines seems to be forthcoming.

The use of by-pass or drifting valves of sufficient capacity to prevent the induction of smoke-box gases into valve chambers and cylinders is an old subject which apparently has never been handled to a final and satisfactory conclusion, yet the benefits of such devices on valve and cylinder lubrication are practically self-evident. It is an economic waste to use live steam, even in limited quantities, in the cylinders of a locomotive for the sole purpose of maintaining valve and cylinder lubrication while drifting on long descending grades, thereby developing unwanted power and necessitating excessive punishment of brake shoes and wheels in order to control the speed of the train. It is imperative that some way be found to eliminate the necessity for this practice, which means that adequate lubrication of cylinders and valves must be maintained when no steam is passing through them.

Another unsolved difficulty connected with valve and cylinder lubrication of steam locomotives is manifest in the deposits of carbon which accumulate in the exhaust passages of superheater locomotives under certain rather prevalent conditions. The periodic removal of these deposits by means which do not damage cylinder castings is a source of trouble and expense from which many railroads would welcome relief.

While it appears probable that roller bearings will be the answer to the problem of satisfactorily lubricating driving- and truck-axle bearings on long-distance high-speed runs without intermediate attention, we must not overlook the fact that roller bearings are very expensive and, in comparison with plain bearings, add a great deal of weight to the locomotive or tender. Moreover, roller-bearing trouble, when it occurs, practically always results in a complete engine failure and an excessive repair bill, whereas plain bearings can generally be cooled down, repacked, and made safe to proceed with only loss of time and a relatively moderate expense for repairs at the end of the run. It is, therefore, still worth while to consider further improvements in grease lubrication of driving boxes, and lubrication of waste-packed trailer- and tender-truck bearings as these are likely to be with us for many years. We know from experience that grease-lubricated driving boxes can be made to run at high speed on runs of 1,000 miles or more without attention enroute, and waste-packed truck boxes can be made to run for almost indefinite distances if saturation of the packing is maintained by the gradual addition of fresh oil by means of a mechanical lubricator.

The lubrication of locomotive crank pins on long and fast runs is a serious problem, but I feel that design enters into this problem fully as much as the quality of lubricants and means for their application. Heavy bearing pressures, due to inertia forces of rods, pistons, crossheads, etc., at high speed are a definite factor in this problem. It may be that roller bearings will prove to be the ultimate solution but the railroads will be operating locomotives with grease-lubricated crank pins for some time to come and will appreciate anything that can be done to improve crank-pin greases.

The only essential requirement for satisfactory lubrication of valve-gear parts with either oil or grease throughout runs of practically any length seems to be the matter of providing sufficient capacity in the cups or storage cavities. It has been the experience of the road I represent that oil is preferable to soft grease for valve-gear lubrication. Surplus grease exuding from the various bearings creates a very unsightly appearance and is indicative of waste. On territories where dust storms are encountered, soft grease, on account of its pasty consistency, collects and retains grit to a much greater extent than oil. This difficulty was also experienced in connection with soft-grease lubrication of locomotive guides.

I have noted with a great deal of interest what the committee has had to say with regard to the lubrication of radial buffing surfaces between engine and tender. It may be true that the extremely hard surfaces of manganese steel castings in contact with each other can be made to run successfully without lubrication, but it is my opinion that better results would be obtained if the hard surfaces are lubricated. We know from bitter experience that trouble in various forms, ranging in severity from excessive wear on chafing surfaces to stretched drawbars and even derailments of locomotives and tenders, can be expected if buffing surfaces of ordinary cast steel are to be run in forcible contact with each other without lubrication. Our line has attained a very satisfactory solution of these difficulties by bronze-facing both sides of the floating buffer block and equipping this block with drilled grease passages through which lubricant can be forced directly to the perpetually dry spots in the central portion front and back of the floating block, as well as between the upper edge of the locomotive chafing iron and the hook portion of the floating block which supports the latter and holds it in place. With this arrangement, together with convenient means for accurately adjusting the clearance between buffing faces, we have avoided a great deal of the trouble.

I am somewhat disappointed that the committee has not given attention to the matter of lubricating center plate bearings of engine and tender trucks. This is a subject which has been brought very forcibly to our attention in recent years and is obviously responsible for a great deal more trouble than is generally suspected. The nature of the trouble ranges all the way from cut flanges and hot bearings to broken center plates and tender frames, and there is reason to believe that dry and rigid center plates have been at least a contributory cause of some derailments. Relief from these conditions requires a careful study of several factors. We have concluded that center-plate bearing pressures should not exceed 450 lb. per sq. in. and are applying floating bronze plates between the body and truck members with a felt seal around the king pin and over the outer flange of the female center to exclude dirt and water. Bearings, when so arranged and lubricated with thin oil, are giving good results.

H. P. Allstrand (C. & N. W.): This report is not complete as to the lubrication of chafing castings. However, we were getting to the friction bearing type—the one in which you have all experienced so much difficulty from rapid wear.

As to radial buffer castings, Mr. Lanning mentioned his design, and he has it designed in such a manner that it does lub-

ricate the surface by using a high-grade lubrication. This should be used. The double radial block is slightly hooded and it protects against the admission of foreign matters. That was not considered in reference to manganese. In many castings a high-carbon steel is being used for the same location. That was not considered in the report.

With reference to lubrication of the tender-truck center casting, we will admit that we have not covered it. It was not lost sight of, but we felt that it was common practice to use waste oil, and waste driving box grease to fill these castings. A great many roads are giving this serious consideration. Many have attempted the Alemite system, and many are piping and using oil lubrication. If I was to venture an opinion, and not a recommendation, I would say that oil lubrication appears to have the call at this time in this location.

W. I. Cantley (L. V.): About seven years ago the Lehigh Valley adopted the force-feed lubricator to provide better lubrication of the valves and cylinders, and, at the same time, considered extending the use of oil lubrication to various parts of locomotives.

Since that time they have applied oil lubrication to 42 0-8-0 type switching locomotives, which included the valves, cylinders, journals, guides, hub liners and air pumps. Thirty-three 2-8-2 type small wheel Mikados assigned to yard service, were equipped with oil lubrication in like manner, and, in addition, the front-truck and trailer-truck journals and hub liners were also equipped. These engines are equipped with the eight-feed, 24-pint force-feed lubricators. Extending the lubrication to the points mentioned is accomplished by the use of oil dividers, which are constructed so as to have two, three or four outlets.

Force-feed lubrication is used as the base lubrication. The cellars of the driving boxes and engine-truck boxes are equipped with pads to act as secondary lubrication, and also to keep the bottom of the journals free from grit and dirt. This method of lubrication in yard service has given us satisfactory results. Our investigations at various times as to the wear on the crown brasses develop we are getting at least double the life from bearings than we previously obtained with grease lubrication.

In addition to the yard engines equipped for oil lubrication we have two Pacific type passenger locomotives which were equipped in 1933, and, on these engines, we are able to lubricate 78 surfaces by the use of oil dividers.

On our road locomotives equipped with force-feed lubricators the following points are lubricated by oil:

158 2-8-2 type locomotives: Cylinders; valves; guides; air pumps; stokers; boosters; hub liners of drivers, engine and trailer trucks.

100 4-6-2 type locomotives: Cylinders; valves; guides; air pumps; stokers; drifting valves; hub liners of drivers, engine and trailer trucks.

40 2-10-2 type locomotives: Cylinders; valves; guides; air pumps; stokers; drifting valves; boosters; front-end throttle; with boosters; hub liners of drivers, engine and trailer trucks.

27 4-8-4 type locomotives: Cylinders; valves; guides; air pumps; stokers; drfting valves; boosters; front-end throttle; feedwater-heater pump; hub liners of drivers, engine and trailer trucks.

The majority of these locomotives are equipped with the 24-pint force-feed lubricators, and some of them with 32-pint force-feed lubricators.

All of the lubrication is with valve oil, and, while there has been an increase in consumption of valve oil on the locomotives, on the other hand our maintenance of various parts lubricated has been reduced. This is particularly noticeable on hub liners of the driving boxes as, because of characteristics of our railroad, with a large number of curves, prior to lubricating the floating hub liners on drivers between the hub of the driver and face of the box, depending on the territory in which the locomotives operated, it was necessary frequently to drop the wheels and take up lateral due to the lateral going to the maximum allowed by the I.C.C. Since the use of oil for lubricating these parts the time between taking up lateral has been increased, and on a number of locomotives we get more than double the mileage between taking up lateral than we did previously when they were not lubricated.

W. M. English (Monon): Owing to the very gratifying results obtained through several years of experimentation with the lubrication of engine trucks by means of the conventional oil cellar, I wish to call to the attention of the committee the possibilities of improvement by the elimination of water that continually collects in the cellar from condensation or from rain or snow. In fast passenger service, trying to avoid delays en route, it was quite common practice in the past, on our line, to repack these cellars, especially in bad weather, at both ends of a 185-mile division. One of our roundhouse packers, noticing the water in these cellars, was permitted to apply an idea and install a device that effectively removes the water collecting in the cellar. Based on the principle of the difference in weight and surface tension of oil and water, the device drains off the water almost entirely without loss of oil, and is incorporated in the cellar casting with practically no cost except change in pattern.

After equipping the same passenger engines, such delays were almost eliminated, and we have test records of one of these engines in daily fast through-passenger service over a period of 14 months without repacking an engine-truck cellar. This engine made approximately 6,000 miles a month. The waste was regularly oiled and occasionally loosened up, but never removed during the test.

We are now experimenting with tender and car journal boxes, but the potential saving is not so great, because the packing is better protected from exposure to water.

W. A. Pownall (Wabash): I am glad to know that the committee is considering a specification for oil for high temperatures of superheated steam. While a valve oil may have a viscosity of 190 to 200 at 210 deg. F. it is very thin, and apparently has no lubrication value at 725 deg.

I would like to ask if the committee has given any consideration to the use of graphite for cylinder lubrication at these high temperatures.

Mr. Allstrand: I will answer the question about the use of graphite first. I believe that some efforts have been made. Personally, I have no first-hand knowledge. If there is someone present who has had experience, I think it would be helpful to have information.

Mr. Cantley's remarks as to service obtained from oil lubrication to driving bearings and laterals seems to justify that we assemble information through questionnaires, at least. We will attempt to propose that the future reports of this Committee contain information regarding the various devices which have been mentioned and which are being tried out, so as to divulge that information and permit the membership to adopt what it desires for test purposes, or to change their practices.

I was interested in Mr. English's remarks. He seems to have a neat arrangement for the elimination of water from engine-truck cellars. We certainly are all interested, and I believe a few more remarks to describe this arrangement are well in order.

Mr. English: The fact is that you can fill this cellar with oil or soap waste and pour a gallon of water in the top of it, and the water will all run out through this opening onto hub base and lubricate it. When the oil gets down there the surface tension prevents the oil from running out. The oil forces the water out of the cellar. All of the water left in the cellar is what is provided by this clearance. We are now casting that on our cellars, and we are rapidly standardizing it. It has been a remarkable device, and we get practically no glazing in the packing such as you ordinarily get in an engine-truck cellar.

In fact, I want it thoroughly understood that we do not run our engine-truck cellars 14 months without repacking, but it has eliminated a lot of the cost of repacking at both ends of the road in bad weather, or in snow. [Mr. English illustrated the device by a blackboard diagram—Editor]

A. G. Hoppe (C. M. St. P. & P.): Mr. Lanning put his finger right on the nub of the problem of the lubrication of cylinders and valves. It is the combination of the use of oil and metal material. We found on some of our high-pressure engines—both the 300 lb. and on a small steam car that runs on about 900 lb. pressure—that we were unable to lubricate like metals running together. Yet, for years we have run cast iron on cast iron. In the case of our Hiawatha engines, we found it practically impossible to run cast iron on cast iron. When we changed to dissimilar metals, first trying all bronze rings and later bronze and cast iron, composite backing, we were able to operate and we find that not only is the wear reducing on the packing rings, but bushings and bull rings have longer

life. Possibly, just a simple change in valve oil won't solve our problems.

Further, in the matter of cylinder deposits, if any of you have analyzed cylinder deposits, you will find that they are largely a combination of oil and boiler salts, and I have been told that in the lubrication of high-pressure, high-temperature stationary engines, the same problem exists. It is not necessarily a matter of boiler priming or foaming, but actually carry-over of limestone, even in highly superheated steam.

Apparently in order to assist lubrication of valves and cylinders, some efficient means must be provided to separate the moisture from the steam going over into the cylinder.

The lubrication of valves and cylinders is a combination of using the proper materials, proper oil and in keeping moisture out of the cylinders.

H. W. Coddington (N. & W.): We are all interested in hub lubrication where we use grease on the journals. We feel certain that a number of heated hub journals originate with hub friction and we have been working for a long time to find some satisfactory method of getting oil lubrication from mechanical lubricators through the hubs.

The trouble is in getting the oil to the point where it will do the most good, and that is right next to the journal, so that the centrifugal action of the hub will have a tendency to distribute it and not throw it off before you can utilize it as a lubricating medium.

We are now going through the process of delivering oil through a drilled hole in the brass to the hub. The hole immediately packed up with hard grease which fills the flexible hose connection from the lubricating line to the journal box. Then we put in a rod which almost filled the hole and supported it from behind by a spring, so that there is a movement in and out, due to the action of the hub against the box. That worked a little better, but soon filled up and the lubrication was stopped. Now we are trying a choke plug similar to the old hydrostatic-lubricator choke plug on the hub side of the box, feeling that with the restriction of the flow of oil through that small opening it will possibly keep the grease out. It is too soon to know how it is going to work out.

C. T. Ripley (A. T. & S. F.): All you men who have the job of selecting lubricants for your equipment have a very hard job. The oil industry is a highly competitive one. We are presented with every kind and nature of oil as a lubricant with very powerful arguments behind them. The man in charge of the selection is somewhat at a loss as to what to do. Competition is a good thing but I think sometimes competition, uncontrolled or undirected, is not all it might be.

Ultimately this committee has a very valuable piece of work to do to coordinate the work of the oil companies. I do not mean to deprecate their work in any way but somehow they all seem to be shooting in opposite directions at times. I often thought that a joint committee of the major oil companies working with our committee might get some basic things established that we can hold to. In doing this they have got to look out that they do not set the standards to take care of the weakest sister. Frankly, I am afraid that is the condition on one specification that has been established.

I know the pressure they are up against, and that is not good for the railroads. If a certain oil company has not got any stock of crude from which they can make the oil needed, they should get that kind of crude somewhere, and not set up specifications or bases which are limited by the poorest stock in the country.

The importance of lubrication on a Diesel engine is overlooked for two reasons. The cost of the oil used is an important factor in the operating cost—more so than on a steam engine. Also it involves the cost of repairs to the Diesel engine to a very high degree. Therefore, the proper use of the right oil must be given major attention.

The report indicates that there is no problem involved in lubrication of any part of the Diesel locomotive except the Diesel engine proper. That has not been our experience. The lubrication of traction motors is a very important matter which involves difficulty, as well as possible danger. The motor-suspension bearings should be lubricated in a better way than they are today. In one engine we have applied a motor-driven force-feed lubricator pumping oil into those bearings continuously. In this way you know what is going on, instead of having men at the terminals. If the bearing goes wrong, there may be serious trouble. The same thing is true of armature bearings. It is true that you can't set up a definite yardstick for all these different operating conditions and different types of engines. Each one has to be studied separately.

I believe there is going to be considerable further development in connection with the design of rings. Some interesting work has been done by English engineers on the use of the bevel-ring groove, which tends to clear itself. Other features of design will probably be made to help the lubricant. We can't ask the lubricant to do everything.

Dust is a major problem in our territory. It affects lubrication but it can be and is being overcome by proper air filtering either at the intake of the engine or as the air comes into the cab. The dirt must be taken out or it will affect lubrication and wear in all other parts.

I can't agree with the committee that it may be possible to use a heavier lubricating oil as the engine gets older. A Diesel engine in heavy service should be maintained so that the use of a heavier oil will not be necessary. You have got to keep pistons, rings, and sleeves in the proper condition. Reference is made to deposit on the rings. The committee's report is a little misleading. It seems to indicate that the kind of deposit you want is a soft, gummy deposit. I think exactly the opposite is true. What you want is a flaky deposit, because that flaky deposit will break itself loose and much of it will go out through the exhaust. But, if you get a gummy deposit the gum gradually cooks and gets harder and harder, and the first thing you know you have got sticking rings—the very thing you are trying to get away from.

For some unknown reason our experience indicates that the naphthenic-base oils have tended to give this kind of deposit. It is exactly contrary to everything that we have been taught in internal-combustion work. With gasoline engines the naphthenic base seems to give the soft, flaky deposit which does not cause the ring to stick as do the gummy deposit formed by other oils.

The committee left out one important factor regarding oil, and that is the question of acidity development. High acidity results in trouble with the bearings. That is one of the factors which I think should be included in our discussion of the type of oil.

The way to study the mileage to be had from lubricating oil, is to take samples at the end of each run, analyze them, and find out what is really developing in the engine. We are not getting the mileage which we can out of many of these oils. It is through fear that we are changing them too quickly, just as we used to do with our automobiles. As far as I know, about 5,000 miles is now the maximum for changing crankcase oil. I am confident that this can be increased to 10,000 miles without danger, if the right kind of oil is used and the dirt is kept out of it. We used to have the crankcase oil changed in our automobiles every couple of hundred miles, but we now find we can run two to three thousand miles.

Another point which I think the committee overemphasizes with Diesel engines is thorough overhauls at uniform periods. I differ with the committee on this. I think the internal-combustion engine does not need thorough overhauls at uniform periods, but needs continual upkeep, taking care of everything just as it develops. In the long run that will cost you less money, and you will get much better service.

Mr. Allstrand: Regarding the cost of oil as related to the periodic overhaul. Our experience with the Diesel engine indicates that Mr. Ripley is quite correct. However, we do feel that there is a limit when a periodic general overhaul must be made.

In the matter of oil consumption, there is a direct relation between the oil consumption and equipment condition. We worked it out to our satisfaction, at least, on the gas-electric rail cars. We determined that there was an economic consumption of oil, and for a number of years we have accurately recorded all of the oil used in each unit, and have been able to establish a mileage consumption, which indicates the necessity of an overhaul. Personally, I believe this can be effectively applied to the maintenance of Diesel locomotives.

We will support our statement as to the nature of deposit. It was the intention of the committee to call attention to the possibility of excessive wear and rapid deterioration of valve assemblies due to hard scale. The information we received was that hard scale has a detrimental action and increases the wear

of the pistons. With that in mind we made the statement with reference to the soft sediment or carbon being less detrimental to wear.

Emphasizing what Mr. Ripley said in regard to the motor-support bearings, we found early in the operation of streamlined trains it was necessary to add oil to the support bearings. We accomplished that by an oil cup and a pipe. It has not been satisfactory. However, this kept us away from burned-up support bearings.

The waste-pipe method on the support bearing has not been satisfactory at all. It occurs to some of us that roller bearings should be worked out for that particular job, but we are restricted in clearances, and it seems impossible to apply roller bearings.

C. M. House (Alton): There is one feature in the report that was not covered and that is that the Diesel engine is both a summer and a winter engine. In the summertime temperatures in the crankcase are higher and if you lose time on a schedule you try to make it up, and run the temperatures up pretty high. It has been our experience in an 1,800-hp. locomotive, where we were inspecting pistons at about 50,000 mi. We had to increase speed to maintain the mileage. Recently we have had to inspect these pistons every 30,000 mi. because we had ring failures from sticking pistons. We have not developed ways and means to keep lubricating oil free from grit and dirt.

While you are discussing lubrication you have got to take in other factors, such as proper materials, rings, and pistons, and at the same time improve the grade of lubricating oils.

K. Cartwright (N. Y. N. H. & H.): We have been operating, on the New Haven, a streamlined train for a couple of years, and so far have had little trouble from lubrication. Perhaps one of the reasons is that that train was designed for a particular service where acceleration was extremely important, and it is powered in order to attain the acceleration required and to make the schedules in that particular service. After the train is accelerated and is running at its cruising speed, it really has a rather low power factor, which probably eases up the lubrication problem of the engine.

Fortunately we have had no trouble in the lubrication of the motor-support bearings. When we started in we were guided largely by the recommendations of the engine builder. We have been experimenti : but we do not feel that we have learned very much yet about the problem of lubrication, other than try to get an oil recommended by the builder of the particular engine for the service in which that engine is operated.

D. H. Nelson (Shell Oil Co.): In the report on Diesel engines one thing was left out. That is the flushing oil used. When we speak of flushing a Diesel engine we take a light oil prepared especially for that purpose. For instance, if the crankcase, and lubricating system holds five gallons, fill it up with an extra gallon and idle the engine at about one-third speed for 45 to 50 minutes. Then, while the engine is still warm, drain the oil out and refill. By doing this you loosen up the rings and dissolve the deposits in and around the rings. Not only that but you clean out the crankcase, and lubrication system and have fresh lubricating oil throughout the engine.

(Upon a motion, duly seconded, the report was approved and accepted.)

The meeting then adjourned.

F. E. Lyford Appointed Trustee of N. Y., O. & W.

Frederic E. Lyford, who is attending the convention as assistant to Robert S. Binkerd, vice-president of the Baldwin Locomotive Works, has received word that he is under consideration for appointment as a trustee for the New York, Ontario & Western Railway. This road is in the process of reorganization under Section 77. It is understood that Mr. Lyford has been appointed a trustee, subject to approval by the Interstate Commerce Commission.

New Life Members of the Mechanical Division

During the past year 21 members of the Mechanical Division have attained the distinction of life membership by virtue of a provision of the Rules of Order which automatically elevates one to this rank after 30 years of membership in the Mechanical Division or its parent associations. The list is as follows:

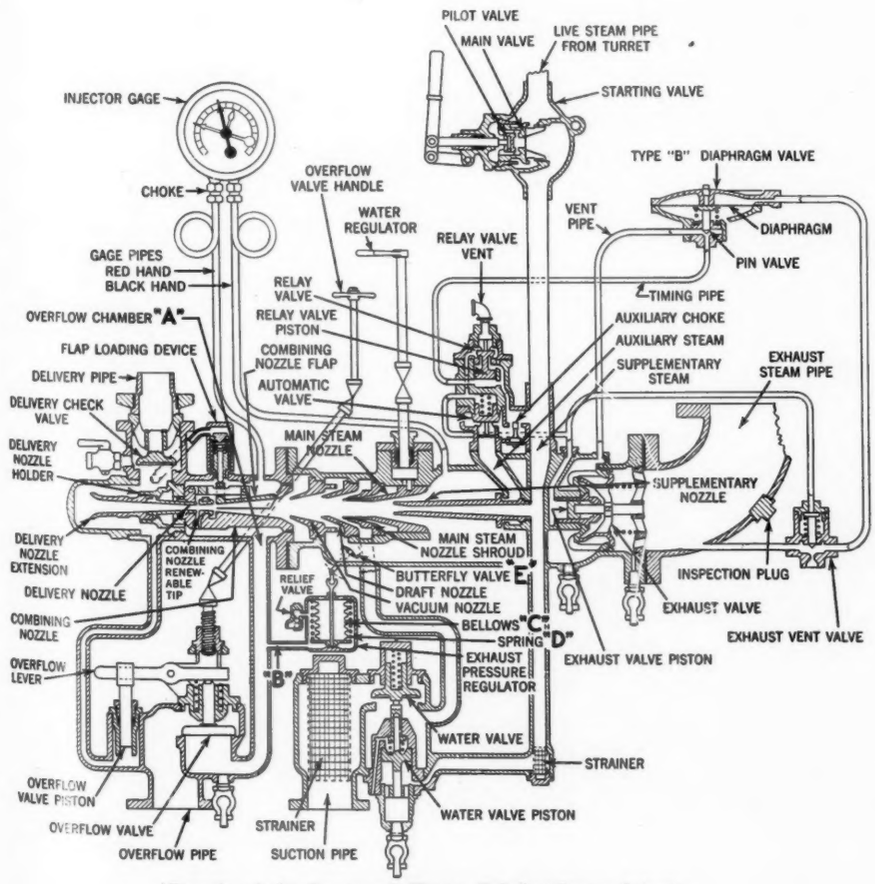
Date Joined	*Name*	*Title and Railroad*
1913	Morgan, C. F.	vice-president, Birmingham & North West.
1914	Welch, J. J.	vice-president and superintendent, Delaware & Northern.
1914	Withrow, P. C.	acting general mechanical superintendent, Denver & Rio Grande Western.
1915	McGill, A. M.	assistant superintendent motive power, Lehigh Valley.
1915	Rosser, H. S.	foreman, Norfolk Southern.
1916	Kerwin, J. M.	superintendent motive power, Chicago, Rock Island & Pacific.
1917	Armstrong, S. T.	superintendent motive power, International & Great Northern.
1917	Bennett, R. G.	general superintendent motive power, Pennsylvania.
1917	Breaker, E. R.	master mechanic, Missouri Pacific Lines.
1917	Downs, W. R.	shop superintendent, New York Central.
1917	Ennis, J. E.	engineering assistant, New York Central.
1917	Gring, W. D.	superintendent motive power, Susquehanna River & Western.
1917	Hardin, F. H.	president, Association of Manufacturers of Chilled Car Wheels.
1917	Jenkins, E. M.	master car builder, Delaware, Lackawanna & Western.
1917	Lever, T. H.	master mechanic, Nevada Copper Belt.
1917	McDannel, A. C.	vice-president and general manager, Port Huron & Detroit.
1917	McGahey, R. E.	master mechanic, Richmond Fredericksburg & Potomac.
1917	Nanney, T. H.	general foreman, Baltimore & Ohio.
1917	Neison, C. J.	superintendent of interchange, Chicago Interchange Inspection Bureau.
1917	Power, J. A.	superintendent motive power and equipment, Texas & New Orleans.
1917	Rafferty, C. D.	master mechanic, Algoma Central & Hudson Bay.
1917	Ream, A. H.	superintendent motive power and equipment, Pittsburgh & Shawmut.
1917	Smith, R.	master mechanic, Missouri Pacific.
1917	Stewart, C. A.	general manager, Temiscouata Railway.
1917	Taylor, F. C. (retired), 303 Pine St., Delmar, Delaware.	
1917	Waring, F. M.	resident inspector-test department, Pennsylvania.
1917	Williams, R. J.	superintendent motive power, Pere Marquette.
1917	Wintersteen, J.	vice-president and general manager, Cornwall Railroad.
1917	Wood, G. H.	supervisor air brakes, Atchison, Topeka & Santa Fe.

New Devices . . .

Exhaust-Steam Injector Improved

The Elesco exhaust-steam injector exhibited by the Superheater Company, New York, has incorporated in its design, among other improvements, an exhaust-pressure regulator that increases its efficiency and stability. The regulator automatically admits to the injector the maximum amount of exhaust steam that the water being fed to the boiler is capable of condensing. When the amount of feed to the boiler is increased the regulator admits more exhaust steam. When the tank-water temperature drops, it admits still more exhaust steam. When high exhaust pressures exist and the amount of feed to the boiler is decreased, the regulator cuts down the amount of exhaust steam entering the injector. Thus, the utmost efficiency and stability are maintained. As a result of these improvements, it is said that the injector will handle water as hot as 150 deg. F.

Referring to the illustration, the details of operation of the exhaust-pressure regulator are as follows: When too much exhaust steam is admitted to the injector, the pressure in the overflow chamber *A* increases. This pressure passing through pipe *B* operates on bellows *C* which is opposed by spring *D*. As bellows *C* is compressed, it closes the butterfly valve *E* sufficiently to reduce the flow of exhaust steam to the point where the overflow pressure is held slightly below that at which water would be spilled to the ground. Thus, the regulator admits as much exhaust steam as the injector can handle, irrespective of the exhaust pressure, the tank-water temperature, or the quantity of water being fed to the boiler.

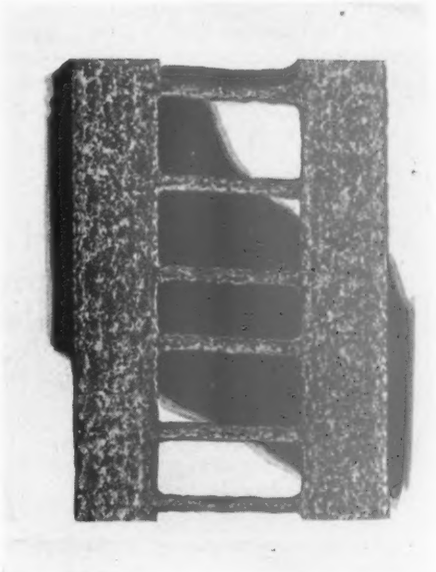


Details of the Improved Elesco Exhaust-Steam Injector

Gasket-Tape Forms Air-Tight Seals

Unarco front-end gasket tape, being exhibited by the Union Asbestos and Rubber Company, Chicago, has been developed to seal hermetically the front-end joint of any locomotive. The patented design of this tape, as shown in the illustration, is such that it can be slipped over the front-end studs and joined at the ends. To accomplish this application the tape is made up of two solidly woven asbestos strips joined by asbestos ligaments, all woven as one piece. Thus, a double air-tight seal is formed entirely around the front end and, because of the flexible nature of this product, a tight joint may be made where the ends meet. With this gasket tape in place it is said that the front of the locomotive may be removed and replaced as often as required without injury to the tape. It is furnished regularly in 100-ft. rolls.

Unarco fire-pan tape, also included in the exhibit of the Union Asbestos and Rubber Company, is made of the same construction as Unarco front-end tape, except that the sealing strips are thicker and wider to suit mudring and studs. This tape is designed to replace ordinary sheet asbestos as heretofore used in making the joint. It has the same general advantages as the front-end tape.



Unarco Gasket Tape for Sealing Locomotive Front Ends and Fire Pans

Versatile Tool Steel Simplifies Shop Practice

The Bethlehem Steel Company, Bethlehem, Pa., is exhibiting its Omega tool steel which has been developed for all the regular applications encountered in the average railroad shop. It was developed to simplify shop practice by using one grade of tool steel, instead of a variety of different types.

Omega steel contains approximately 0.55 per cent carbon, 2.15 silicon, 0.20 vanadium, and 0.45 per cent molybdenum. It was developed primarily for shock-resisting parts in which a combination of great hardness and ductility is called for, and it is recommended for severe and unusual service in such tools as hand chisels, pneumatic chisels, shear blades, punches, punch dies, rivet sets and rivet busters, beading tools, and calking tools—in fact for all uses where light or heavy tools are subjected to drastic and repeated impact at normal temperature.

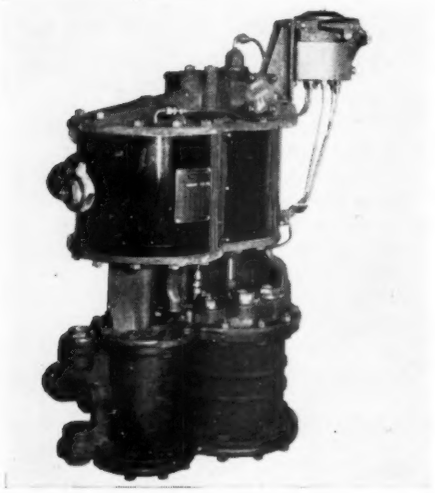
This is primarily an oil-hardening steel, and parts of intricate shape should always be quenched in oil. However, with care, it is often treated very satisfactorily by quenching in water. Either treatment produces the combination of high strength and toughness that is characteristic of this

grade of steel. Properly heat-treated it develops a tensile strength of 340,000 lb. per sq. in., a yield point of 310,000 lb. per sq. in. and an unnotched Charpy value of 121 ft.-lb. with a Rockwell hardness of 58C and an Izod value of 7 lb. per sq. in. Drawing at a slightly higher temperature gives even greater toughness, or an Izod value of up to 15 lb. per sq. in., without materially affecting the tensile strength

In heat-treatment Omega steel is said to respond to a wider temperature range than carbon steels. No expensive equipment is needed. It forges readily between 1,850 and 1,950 deg. F.

Mechanical Lubricator For Air Compressors

The Westinghouse Air Brake Company, Wilmerding, Pa., has developed a mechanically operated lubricator for air compressors, called the F-1 type, which is designed to feed the correct quantity of oil positively, and at a rate proportional to the compressor labor. This lubricator



Air Pump Equipped with Westinghouse Mechanical Lubricator

comprises six plunger pumps arranged to provide individual and independently adjustable oil supplies for each point of the compressor system, viz., the throttle valve, the governor, the reversing valve, steam cylinders, and air cylinders. If any of these six plunger pumps are not required for a particular installation they can be omitted and their outlets blanketed. Each plunger is raised in succession by a cam to admit oil to its pump cylinder, and is forced downward by a spring at high velocity to discharge the measured quantity of oil under high pressure past two discharge ball check valves through the delivery pipe, and past the non-return check in the terminal fitting to the part to be lubricated.

The cam is fastened to a ratchet wheel which is rotated by a pawl attached to a small operating piston that is actuated by air from the low-pressure air cylinder. As the compressor piston moves upward, air pressure is developed on the face of the small operating piston which moves forward to advance the ratchet wheel one notch by means of the pawl. On the down stroke of the compressor piston air pressure is reduced on the face of the operating piston, which is then retrieved by a spring. During 100 double strokes of the compressor the ratchet wheel rotates once and each plunger pump makes one stroke. It will thus be evident that a positive quantity of oil is discharged to the several parts only when the compressor is running and at a rate directly proportional to the compressor speed. The amount of oil fed by each pump at one time can be varied by independent adjustment of the downward stroke of the plunger.

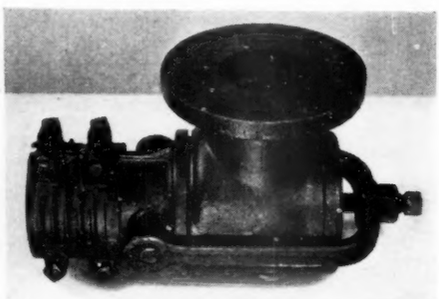
The lubricator is provided with two oil chambers, one having a capacity of two quarts, the other one quart, so that different oils may be used for the steam and air ends if desired. Four pumps are connected to the large chamber, and two to the smaller one. Both chambers may be connected together if it is desired to use one oil for all purposes.

The oil filling opening is fitted with two close-mesh strainers to prevent foreign matter being carried in with the oil supply. The opening is sealed with a close-fitting hinged cover. Additional strainers around each oil-pump intake protect them from sediment that may be in the reservoirs.

A heating chamber, connected to the live-steam pipe, keeps the oil at proper temperature for satisfactory operation. Lagging is applied to the lubricator body as an additional protection against cold-weather exposure.

T-Z Tank-Hose Coupler With Strainer included

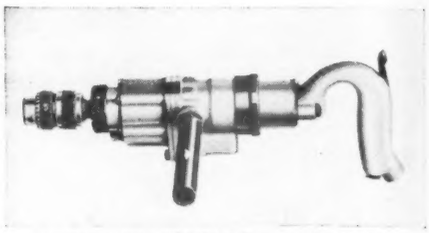
The T-Z Railway Equipment Company, Chicago, has on exhibition straight and angle types of tender-hose couplers and strainers designed with a yoke bolt for quickly disconnecting the tank hose and removing the strainer for cleaning. The joint of the coupler is sealed by a heat-resisting rubber gasket. The cylindrical copper strainer contained within the coupler has a water capacity of more than four times that of the hose which insures adequate water supply should the strainer become partially clogged. Corrugated hose-clamp anchors on the coupler make it possible to clamp the hose so that it cannot slip off. This type of coupler is manufactured for tank hose from 2½ in. to 4½ in. in diameter.



T-Z Flange-Type Coupler and Strainer Used With Feedwater Heaters

Multi-Vane Reversible Tapping Machine

The Ingersoll-Rand Company, Phillipsburgh, N. J., is exhibiting its size 1T multi-vane tapping machine which has reversible gearing. When tapping, the operator pushes on the handle to engage right-hand (clock-wise) gearing



Ingersoll-Rand Multi-Vane Reversible Tapping Machine

which drives the tap into the hole. When the hole is tapped to the desired depth, the operator pulls back lightly on the handle, thus reversing the direction of rotation and backing the tap out of the hole. Reversing is accomplished instantly without stopping the motor. The average tapping speed is 375 r.p.m., while the speed in reverse is 800 r.p.m. The 1T tapping machine is suitable for ¼ in. to ⅜ in. tapping, depending on depth of hole, hardness of metal and the size of tap drill used.

An Automatic Blow-Off System

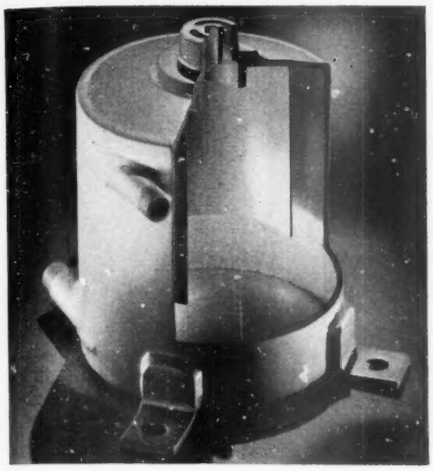
The Dearborn Chemical Company, Chicago, has introduced and is now exhibiting a constant automatic blow-off system. With this equipment, a predetermined quantity of water is continuously and automatically blown off while the locomotive is in operation. An interchangeable restricted orifice determines the amount of water discharged in accord with the requirements of each engine division. The heavy periodic blows of the older method are eliminated on the road. In this way the inherent difficulties encountered with the intermittent method of manual blow-down are eliminated and the concentration of boiler water simply and automatically controlled.

Extensive tests have demonstrated that by the use of this device, in conjunction with Dearborn feedwater treatment, boilers can be kept clean and foaming prevented for periods of thirty days without washing out.

The constant automatic blow-off system consists of the following parts: A trip valve, trip-valve bracket and pin, trip-valve actuating arm with roller and pin,

trip-valve washer, blow-off valve, and steam separator.

A ½-in. pipe line furnishes steam from the combination head to the trip valve, under constant pressure. The off side of the trip valve is connected to the operating cylinder of the blow-off valve by means of a ½-in. pipe. The trip valve, when



Steam Separator Used in Connection With Dearborn Constant Automatic Blow-Down System

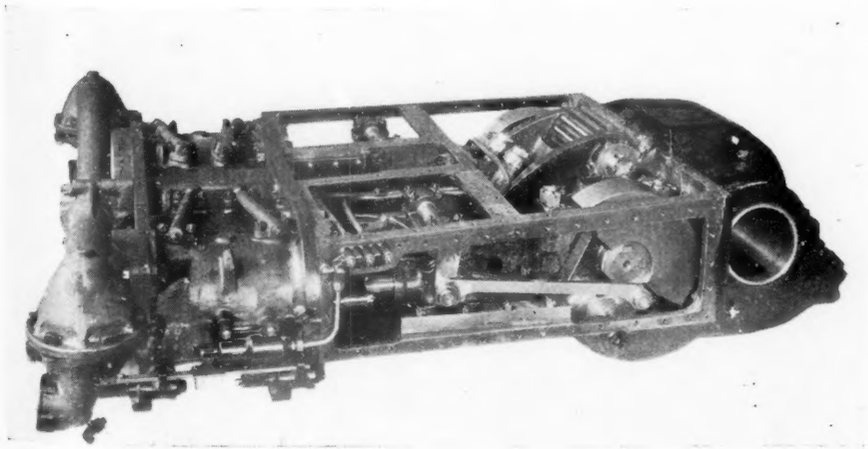
opened by the actuating arm in contact with the locomotive throttle lever, will furnish steam to the blow-off valve cylinder, causing it to open automatically. When the trip valve is closed the steam is exhausted through a small port in the piston of the blow-off valve.

Franklin Type E High-Speed Booster

The Franklin Railway Supply Company, Inc., New York, is exihibiting its Type E booster designed for working pressures up to 350 lb. per sq. in. and for operating at high speeds; it may be cut in at any speed up to 21 m.p.h. and may be operated up to a speed of 35 m.p.h. The booster has been designed for gear ratios of 2 to 1, 2¼ to 1, or 2.57 to 1 and for any fixed cut-off of 35 per cent or longer. Starting ports are provided on the limited cut-off principle. The engine on exhibit has 10½-in. by 12-in. cylinders, but may be furnished with cylinders of any size up to 11-in. by 12-in. With these three variables a wide range of operating conditions can be taken care of in the one basic design.

The booster is fitted with roller bearings on the idler-gear shaft and on the crank shaft. Automotive-type thin-wall steel-back bearings with spun bronze linings are used on the crank-pin of the main rod and thin bronze sleeve bearings are used on the wrist-pin end of the rod. Ring-type piston valves, instead of plug-type valves, are now being used.

The same principles of control are used with the Type E booster as are part of the earlier designs of Franklin boosters. However, the Type E booster has the additional features of automatic lubrication control, automatic provision for furnishing additional steam to the booster in the event the main locomotive engines slip and starve the booster, as well as the automatic throttle check valve on the earlier boosters.



The Franklin Type E Booster Can Be Cut In Up to 21 m.p.h. and Operates at Speeds up to 35 m.p.h.

Insulating Material For Electric Cables

A synthetic insulating compound has been recently introduced commercially and is being exhibited by the General Electric Company under the trade name Flamenol. While similar to rubber in its characteristics, it contains no rubber and will not support combustion. In addition to being non-combustible it is highly resistant to moisture, acids, alkalies, and oils. It has excellent aging characteristics and is strong mechanically.

The properties of Flamenol are such that it can be made a very soft and flexible compound, or made to be one with celluloid-like rigidity. It can be put into solution for coating or impregnating, and can be compounded, filled, calendered, and extruded in much the same fashion as rubber.

Flamenol-insulated cable is recommended for power and control circuits at 600 volts and less, and for operation at a maximum copper temperature of 60 deg. C. It is adapted to machine-tool wiring, switchboard wiring, and battery and coil leads. The insulation has a permanently smooth finish and foreign materials do not readily adhere to its surface. It is available in a variety of colors for circuit tracing. For most applications it is used without any protective finish, such as braid, lead, or armor. It is only where the cable will be subjected to extreme mechanical abuses that such a finish is necessary.

Air Strainer for Steam Driven Air Compressors

The Westinghouse Air Brake Company, Wilmerding, Pa., is exhibiting cartridge-filter type air strainer for steam-driven air compressors. The filtration element of this strainer, which may be removed for cleaning without disconnecting the entire device, is comprised of a corrugated and radial wire-mesh assembly covered with a layer of thick felt so constructed that the actual filtration area is many times the

Cartridge-Type Air Strainer for Steam-Driven Air Compressors

inlet or outlet passage areas. This element also has large felt washers on each end to seal on the shoulders surrounding the outlet passage on the upper end, and the bottom cap nut and shell on the lower end.

The inlet opening is formed in the under side of the cover as an annular ring around the shell. As the air enters this opening it passes upward and inward to the inside of the shell where it strikes a baffle and is directed downward before passing through the filter element into the discharge opening. Some of the heavier particles of dirt are carried downward and deposited at the bottom of the shell cavity.

The cover is centrally threaded for a 2-in. pipe outlet to the compressor, and has two mounting studs by which the unit can be secured to any bracket. The shell is of pressed steel and is attached to the cover by means of a clamping bolt and nut. This shell houses the filter element and acts as a dirt chamber. In the bottom are several small holes to permit moisture to drain from the chamber.

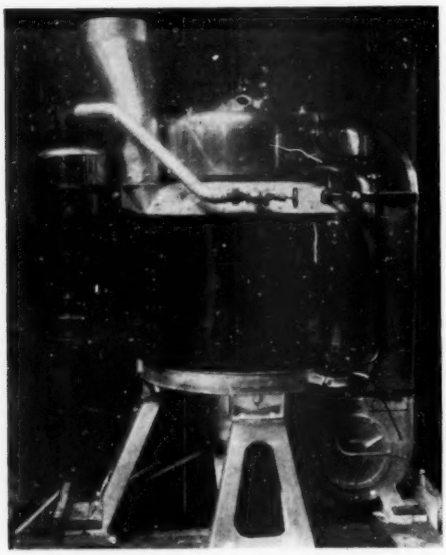
When it is necessary to dismantle the strainer for cleaning or changing the filter element the only labor involved is to loosen the nut on the clamping bolt which will allow the bottom cap and shell to be removed, exposing the filter element for examination and cleaning.

Steam-Generating Unit For Diesel Locomotives

The Vapor Car Heating Company, Chicago, is exhibiting its coil-type steam-generating units which are available in several sizes with capacities ranging from 600 lb. to 2,250 lb. evaporation per hour. They are exceptionally small and light, averaging approximately 1 lb. of steam generated for each 1½ lb. of dead weight. It requires only from 1 to 2 min., after starting the unit with cold water, to develop 200 lb. per sq. in. steam pressure.

These units are fully automatic, burn Diesel engine oil, are equipped with safety provisions against any kind of failure, and are supplied complete with oil burner of special design having an average heat release of over 1,000,000 B.t.u. per cu. ft. of furnace volume.

The ratio of evaporation is 10 to 12 gal. of cold water to 1 gal. of fuel oil. The



Vapor CA-4160 Steam-Generating Unit Used on Diesel Locomotives

heat transfer averages 13,500 B.t.u. per hour per sq. ft. of generator heating surface, and the evaporation is approximately 38.5 lb. per hr. per sq. ft. of steam surface.

The following general data apply to the CA-4160 unit, which is illustrated: Capacity, 1,600 lb. of steam per hr.; operating pressure, up to 300 lb. per sq. in.; weight, 2,435 lb.; rating, 50 hp.; ratio of evaporation, 12 gal. of water to 1 gal. fuel oil; floor space required, 3½ ft. by 6½ ft.

The construction of the steam-generating unit is of particular interest. The combustion chamber is completely surrounded with the coil assembly. The ends of coils are so shaped that an effective seal is made to prevent by-passing hot gases. The coil construction is so arranged that a complete stagger is provided, with free flow for gases which are split up into narrow films. The water movement through the coil is contra-flow to that of the fire gases.

The coils are designed and arranged to allow for free expansion but held in firmly staggered relation for maximum heat transfer. All coils are easily and quickly removable when necessary. Between the coil assemblies a soot blower is provided to remove the accumulated soot when necessary.

During operation an excess of water is continually circulated through the coils. This excess approximates 5 per cent more water than is required for evaporation into steam but the generating unit is designed to operate properly with anywhere from 2 per cent to 20 per cent excess water circulation.

The oil burner operates at a two-stage fire, either high or low. Proportions of fuel to water and of air for combustion are relatively adjusted for both a high and a low fire. A single motor drives the feedwater pump, fuel pump, magneto for ignition, and blower for combustion air.

The safety features include a stack switch or photo-electric cell to protect against ignition failure; a pressure switch to regulate either high or low fire and to protect against excessive pressure, that is, shut off the fire entirely; and another stack switch which prevents overheating of the stack. Safety and relief valves protect against pressure accumulation and back pressures. If too much steam is being generated even at a low fire, the pressure switch will automatically stop the burner. Constant ignition is used either by means of a magneto or a transformer so that automatic lighting or re-lighting of the fire is assured.

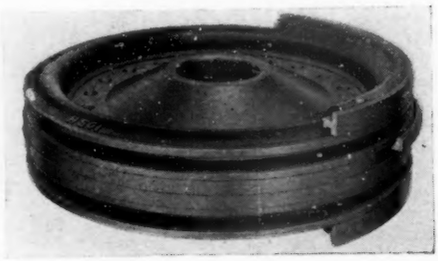
These units can be supplied for either a.c. or d.c. current. They are being used on Diesel locomotives, in stationary service and for certain industrial purposes.

Renewable Piston Trailer Rings

The Hunt-Spiller Manufacturing Corporation, Boston, Mass., is exhibiting a recently developed locomotive piston in which renewable trailer packing-ring segments are used. The purpose of the trailer ring segments is to provide readily renewable rings which will carry the weight of the piston. The feature may be applied to practically all designs of piston heads, including the riveted-on bull-ring type, solid type, or the Hunt-Spiller Z-type plate piston.

As shown in the illustration, these trailer rings are T-shaped in cross section with the added advantage of a locking lip to hold the segment in the trailer-ring groove. The rings are sectional and cover an arc from 90 deg. to 120 deg. on the bottom of the piston. Grooves for the rings can be machined when the grooves for the cylinder packing rings are being machined.

The trailer ring segments simplify maintenance since, when they are worn comparable with the wear on an ordinary piston, their renewal does not require an entire set of packing rings. The design of the trailer segments is such that they can be applied easily and so restore the piston to its correct central position in the cylinder. They thus tend to prolong the service life of both the piston and the rings and to better cylinder performance.



Locomotive Piston with Hunt-Spiller Trailer Ring Segment

Fatigue Resistant Pipe For Railroad Service

Pipe made of basic open-hearth steel especially adapted for railroad requirements for use in air, steam and water lines has recently been introduced and is being exhibited by Bethlehem Steel Company, Bethlehem, Pa. "Ammonoduct," as this pipe is called, is made of soft, open-hearth steel which is not susceptible to the fatigue and vibration failures frequently exhibited by steel pipe made by conventional methods. It is reported that Ammonoduct can be crushed flat without fracturing.

The advantages of pipe made from open-hearth steel were recognized long ago. However, the difficulty of obtaining satisfactory butt welds prevented a general acceptance of this steel as a material for pipes. Bethlehem Steel Company reports that its metallurgists have now developed a furnace practice which removes this difficulty.

The physical properties of Ammonoduct pipe average approximately as follows: Tensile strength, 47,500 lb. per sq. in.; elastic limit, 26,750 lb. per sq. in., and elongation in 8 in., 30 per cent.

All standard-weight Ammonoduct pipe is tested hydraulically at a pressure of 1,500 lb. per sq. in. Ammonoduct can be threaded with ease and can be welded by any process. It is butt-welded in sizes up to and including 2 in., and lap-welded in larger sizes. All standard diameters, from ⅜ in. to 16 in., are produced in regular and extra weights. Ammonoduct has been installed on several thousand cars during the last six to nine months.

Coffin Feedwater System—A Correction

In the description of the Simplified Coffin Feedwater Heater System which appeared on page 1004D37 of the June 16 *Daily Railway Age* it was erroneously stated that the delivery pressure of Coffin boiler-feed pump was 50 lb. per sq. in. The pump, however, is capable of delivering water against a head of 500 lb. per sq. in.